Operation specimen of upper portion of humerus removed for sarcoma. It also shows required
length for fibula transplant.

INTERNATIONAL CLINICS

A QUARTERLY

OF

ILLUSTRATED CLINICAL LECTURES AND
ESPECIALLY PREPARED ORIGINAL ARTICLES

ON

TREATMENT, MEDICINE, SURGERY, NEUROLOGY, PÆDIAT-
RICS, OBSTETRICS, GYNÆCOLOGY, ORTHOPÆDICS,
PATHOLOGY, DERMATOLOGY, OPHTHALMOLOGY,
OTOLOGY, RHINOLOGY, LARYNGOLOGY,
HYGIENE, AND OTHER TOPICS OF INTEREST
TO STUDENTS AND PRACTITIONERS

BY LEADING MEMBERS OF THE MEDICAL PROFESSION
THROUGHOUT THE WORLD

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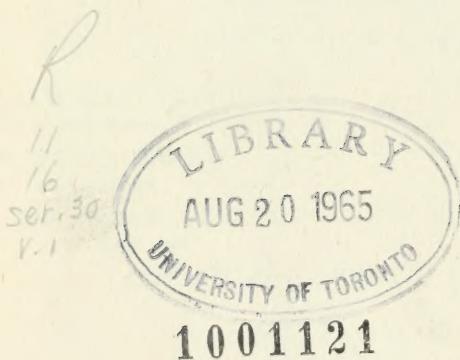
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Clinics

SOME VERY SERIOUS DISORDERS OF THE HEART-BEAT THAT HAVE PROVED COMPATIBLE WITH PROLONGATION OF LIFE AND EFFICIENCY

By LOUIS FAUGERES BISHOP, A.M., M.D., Sc.D., F.A.C.P.

Clinical Professor of Heart and Circulatory Diseases, Fordham University School of Medicine, New York City; Physician to the Lincoln Hospital, New York

WHAT is considered to be one of the most serious of all heart lesions that is shown by electrocardiology is *partial heart block*. In persons so affected the impulse is blocked by a diseased spot in the heart, so that it must travel around in a circuitous course to reach the whole of the ventricular muscle, usually first to one ventricle and then to the other ventricle.

Mr. L. P. P. P., a gentleman sixty-seven years of age, a retired business man and devoted to sport, consulted me because when he played golf to excess he was somewhat short of breath, and because he had some discomfort referred to the left armpit. His blood-pressure was about 160, with a diastolic pressure of 120. He was advised that he had a moderate degree of arteriosclerosis and that a careful regimen was advisable. He has submitted to a fairly strict diet and was able to resume his activities, which he has done ever since. When he was seen a few days ago his blood-pressure was diastolic 100, systolic 140, and he has felt discomfort in his chest on two occasions in two months and that was very slight indeed. He looks well and is able to be more active than the average man of his age.

The electrocardiogram shows that the stimulus from the auricle takes slightly longer than normal to arrive in the ventricles. It also shows that there is an abnormal method of contraction of the ventricular muscle.

In Fig. 1 can be seen the wave marked *P*, which is due to the action of the auricle, and the waves marked *R*, *S* and *T*, which are caused by the ventricle. The time which elapses between the begin-

ning of the auricular wave and the beginning of the ventricular waves represents the time taken for the auricular stimulus to pass through the auricle and the connecting path to the ventricles, and should not be quite .18 second, or at the outside limit, .20 second.

In this case this is .22 second, so that there is a slight delay in the transmission of this impulse, which delay is due to a diseased condition of the muscle along the paths which the stimulus must travel. Signs of disease of the muscle of the ventricle itself are found in the shape of the ventricular waves, R, S and T. They are abnormal in two respects. That is, the R and S waves take too long to come to an end, and secondly, the T wave is in the opposite direction to the larger of the R and S waves in both lead 1 and lead 3.

The lines that form the waves R and S may be likened to a pair of legs and may be said to be straddled too wide apart. They take up too much space. These are simply other ways of saying that they last too long. They should be over and done with in the space of .10 second, which in our record is represented by 2 or $2\frac{1}{2}$ mm. In this record of Mr. L. P. P. P. they last for .16 second or 4 mm. and this is almost double their normal duration.

The T wave in lead 1 of this electrocardiogram is directed down, so that the line of the record rises to the level marked X, which is the resting level. In lead 3 of this record the T wave is directed upward, so that the line of the record falls to the resting level. In each of these leads the T wave is seen to be in the opposite direction of the larger of the waves R and S, opposite to R in lead 1 and to S in lead 3.

This is the second characteristic feature of abnormal electro-cardiograms of this sort and, taken with the abnormally long duration of the R and S waves, clinches the diagnosis of a diseased process in the ventricular muscle, which interrupts one of the main paths by which the stimulus from the auricle is distributed to the two ventricles. The stimulus reaches only one ventricle, so that this starts a contraction alone, the other ventricle following a small fraction of a second later.

Mr. L. H. M. L., twenty-six years of age, a letter-carrier, was sent to me to be examined because a gentleman who had had a thorough examination himself was so pleased with it that he wished to have his letter-carrier, who had heart trouble, examined.

The man himself did not complain very much, though he did say that after delivering a good many letters he sometimes had a little shortness of breath and discomfort in his chest. A thorough examination showed that he had a loud double mitral murmur, while the X-ray showed the heart very much hypertrophied.

The electrocardiogram of Mr. L. H. M. L. is seen in Fig. 2, and bears a great similarity to Mr. L. P. P. P. The P wave due to the auricle, the R, S and T waves, due to the ventricle, are all similar enough to those of the first record to be readily recognized. In this patient the interval between the beginning of the auricular wave P and the ventricular wave R is only .18 second, $4\frac{1}{2}$ mm. in our record, so that this patient has not the disease which was shown by the first record along the paths conducting the stimulus from auricle to ventricle.

The waves due to the action of the ventricles of this man are abnormal in just the same respects as were those of Mr. L. P. P. P. The R and S waves are straddled too wide apart. They occupy too much time, and the wave T in lead 1 is directed downward below the resting level and in lead 3 upward above the resting level; in lead 1 being the opposite to the large R wave and in lead 3 opposite to the large S wave. He, too, then, has a disease of the muscle of the ventricles in addition to the disease of the endocardium, which led to a mitral narrowing, and owing to the disease of the muscle the ventricles do not contract in a normal manner.

A third case which showed this sign of myocarditis within the ventricle showed likewise the presence of auricular fibrillation. This man's record, as shown in Fig. 3, has the large, broad R and S waves which have been mentioned, and likewise, instead of the P wave denoting auricular contraction, a series of small waves during ventricular diastole, which are due to fibrillation of the auricle and are marked FFF. This heart was carried by a gentleman seventy years of age, Mr. L. P. H. F., who is the head of an important financial institution, and who apologized for not keeping his appointment the other day because he was carrying on the work of his cashier, who had been called away for some reason. He has been through serious worries and anxieties during the past year on account of the death of his wife from cancer, and has borne burdens and responsibilities that would have crushed many a young and healthy man. He prom-

ised to come to New York for a review of his condition, though he does not know why he should be always running to doctors.

Almost all modern cardiology revolves around the subject of fibrillation of the auricle and a recognition of this was the most striking event in the beginning of the development of what might be called the modern era. While the serious nature of this trouble is usually appreciated when we realize that it amounts to a paralysis of the auricle, nevertheless there are a good many people with this trouble under our observation who are getting along very well indeed.

In 1911 I was called to meet in consultation Doctor John Dooling, of Brooklyn, to see with him Mr. F. I. M. Mr. M. was suffering from an attack of dropsy, with great shortness of breath. His pulse was very rapid and irregular. He had always believed since boyhood that he had some heart trouble, nevertheless had been able to get along pretty well, in spite of the abusive use of tobacco and alcohol. He was taking five or six drinks of brandy every day and smoking numerous cigars. He was taking digitalis, but as I believed, in insufficient quantities. My only advice was to give the digitalis in larger doses, as I believed that he had fibrillation of the auricle, which at that time had only been described for a few years. I ventured the opinion that the use of digitalis would have to become a habit with him, just as his whiskey or any other thing that he found a material aid to his happiness.

He went on for a number of years doing very well, except that on several occasions he neglected his digitalis, and drifted into a condition of œdema, but on each occasion recovered after the renewed use of digitalis. About this time he made the acquaintance of a German chemist in his neighborhood who supplied him with a good infusion of digitalis. He contracted the habit of carrying this in one hip pocket, while he carried his whiskey flask in another, and he learned so well the application of the digitalis to his needs that he has gone on for a large part of eight or nine years with little medical attention. The recent prohibition movement has deprived him of alcohol, but in spite of that, he seems to be about as well off at the age of sixty-six as he was at the age of fifty-eight, when I first knew him.

The accompanying electrocardiogram was one of the first that I

Fig. 1.
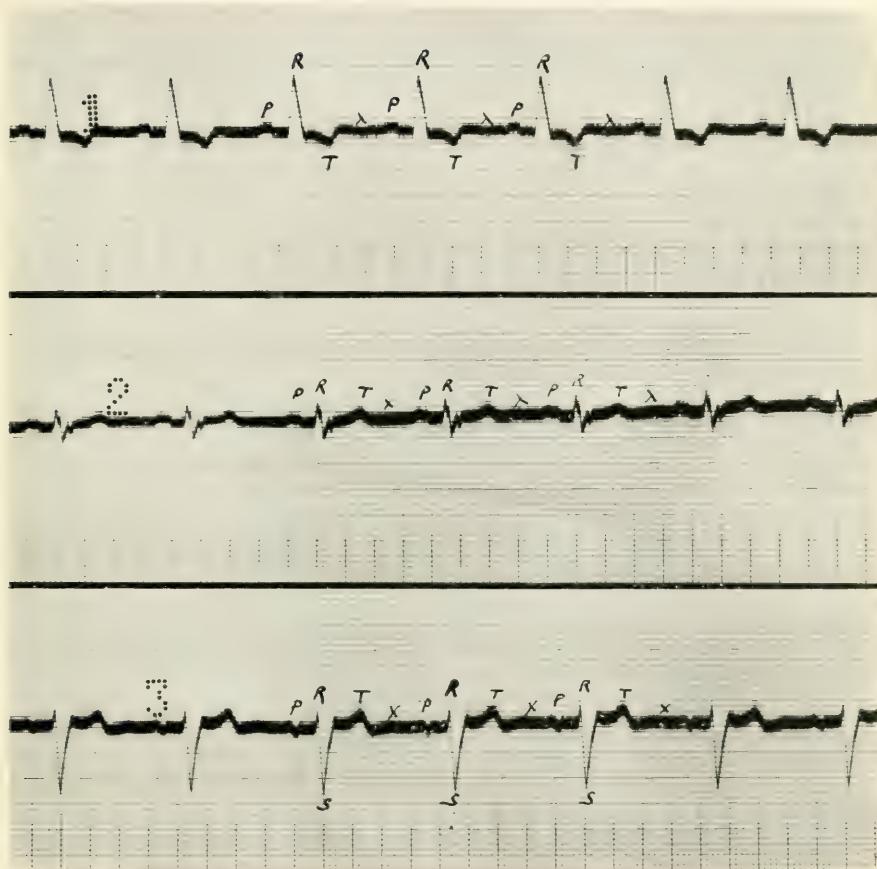
All of the records should be read from left to right. The vertical lines at the bottom of the records are the time marker and the space between each line is $1/25$ second. This figure shows the abnormal shape of the ventricular waves R, S and T of Mr. L. P. P. P. X indicates the resting level of the record.

Fig. 2.
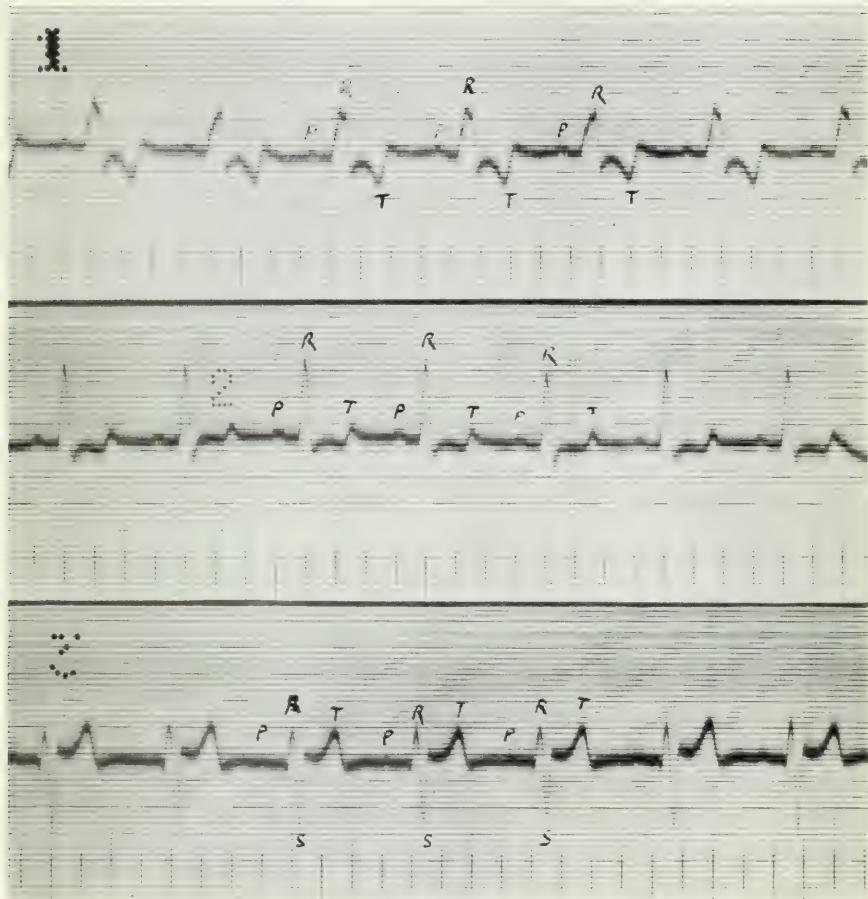
The record of Mr. L. H. M. L. shows the same abnormally shaped ventricular waves seen in Fig. 1.

FIG. 3.
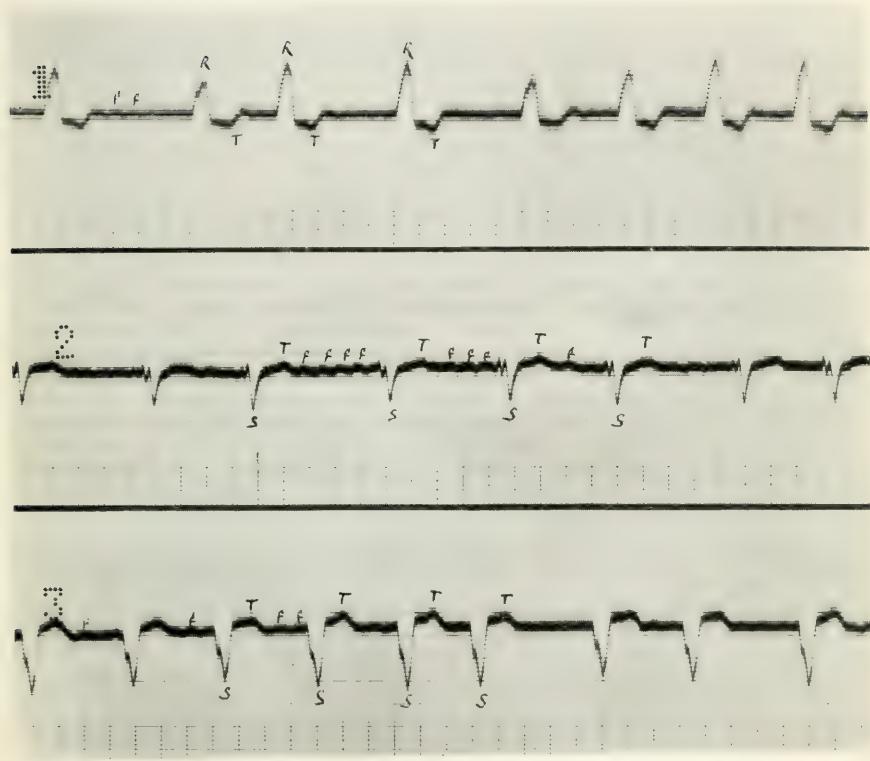
Mr. L. P. H. F. shows a very similar abnormality of the ventricular waves and likewise the waves marked *F F F F* due to fibrillation of the auricles.

Fig. 4.
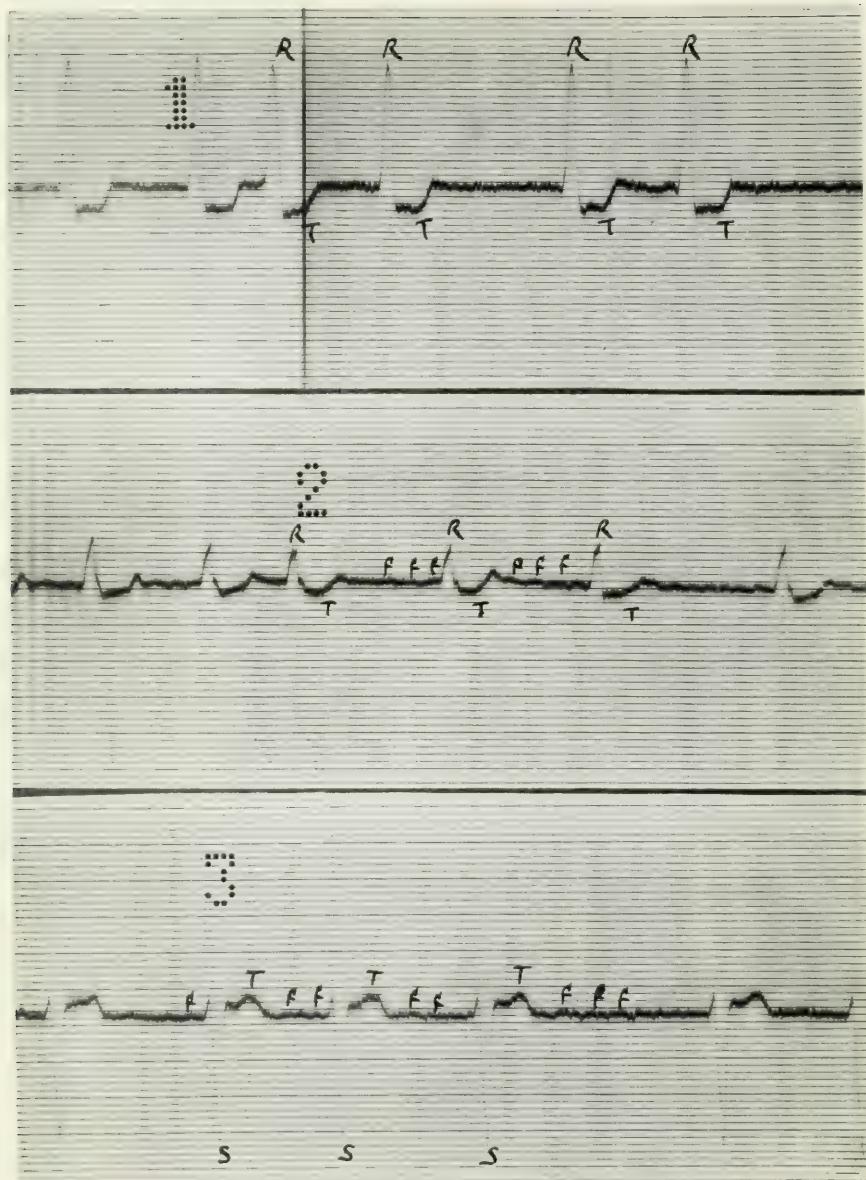
Mr. F. I. M. shows the waves of fibrillation of the auricles and the large *S* wave in lead 3 due to hypertrophy of the left ventricle.

took when I got my own machine, but in spite of the imperfections of the picture, it is very characteristic. This man's record, Fig. 4, shows the characteristic irregularity of the ventricles, while in the pauses between the ventricular waves are seen instead of a single wave due to the contraction of the auricle, the small wavelets due to auricular fibrillation and marked *FFF*. The ventricular waves themselves show that the left ventricle is considerably hypertrophied and the infrequency of these waves indicates a slow heart rate, due to the action of the digitalis. I met Mr. M. three days ago and he has promised to come in for a complete re-examination when he has time, but he does not feel it is necessary for his health.

Mr. H. P., who is head of the business department of a large manufacturing concern, came to me five years ago complaining of shortness of breath and palpitation. He had been told that he had a very serious heart trouble and must keep very quiet. His record also showed the presence of fibrillation of the auricles. He was taught the use of digitalis and has reported from time to time for observation, but has not been laid up at any time during these five years and is still in pretty good condition, having just passed his fifty-first birthday.

Mr. L. B. S. O. came under my care two years ago during an attack of completely broken compensation. His record also showed that auricular fibrillation had taken the place of the normal auricular contractions. He responded promptly to treatment and under careful supervision has been able to carry on his work during the past two years, which included various war activities, and is at the present moment in active business. All this in spite of the constant presence of auricular fibrillation, as shown by repeated records.

These three examples of chronic paralysis of the auricle which are illustrated are under our observation at the present time and at least a score of others, who are doing equally well.

The great advantage of the modern point of view is that we know that the part of the heart involved is not of great importance from a mechanical point of view and were it not for the irregularity and over-rapidity of the heart, would not be of grave importance. In former times these people were supposed to be suffering from so-called chronic myocarditis and were constantly sources of anxiety because,

in his mental picture, the physician considered the whole of the heart involved. Undoubtedly, these people who could go on year after year carrying this condition with impunity when the irritation of the diseased auricle is allayed by the continuous use of digitalis, have pretty healthy ventricles. The successful care of chronic fibrillation with a good deal of liberty of action is dependent upon this modern knowledge of the condition.

Another condition which has proved to be compatible with the prolongation of life in a most surprising way has been two examples of aortic regurgitation of extreme severity.

One was Mr. M. M. S., forty-two years old, who has been under observation over three years, with almost complete destruction of the aortic valve from specific disease. His blood-pressure varies from about 40 diastolic to 180 systolic and he has a good deal of pain in his left arm. He is absolutely dependent upon nitroglycerine for his comfort and for the past three or four years, to my knowledge, has taken two and one-half grains a day. This man's heart is so conspicuously out of order that every physician he saw fell into the mistake of telling either him or his family that he was liable to die at any moment and probably would not survive more than a few weeks.

He became so disgusted with being told he was going to die that he finally gave up going to physicians, and when I first saw him four years ago he had not seen a physician in a year. He was suffering great discomfort and needed medical care. Either because it is my habit never to indulge unnecessarily in the conceit of prophecy, or because he told me his story in advance I do not remember, but at any rate, I have taken care of him ever since, and I think on the whole his condition is improved, though I do not think he ever passes a single night that he does not have to stand bolt upright part of the time to get relief from his anginal pain.

Another example of the same trouble, probably of rheumatic origin, is Miss H. P. I. I saw her first in consultation with Doctor Charles G. Kerley, when she was eleven years old, eight years ago. She also has almost complete destruction of the aortic valve, her blood-pressure has been from 20 diastolic to 200 systolic, and she, too, is dependent on nitroglycerine for comfort, but in general is getting along very well and getting a good deal out of life.

Fig. 5.
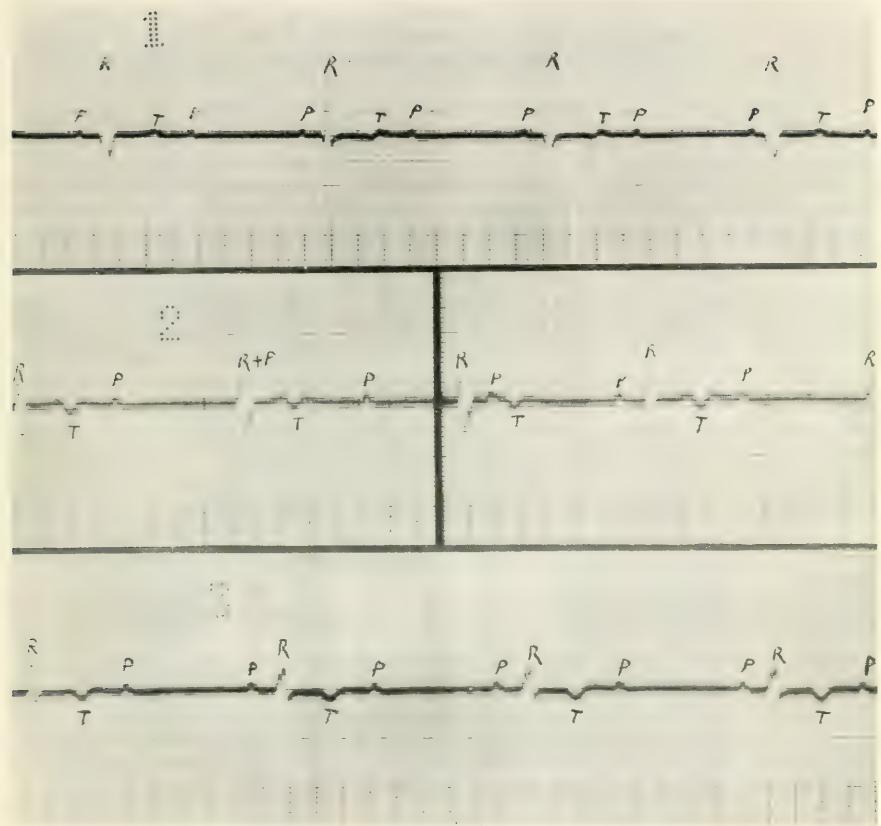
Complete heart block. The auricular waves *P* bear a constantly varying relation to the ventricular waves *R* and *T*.

FIG. 6.
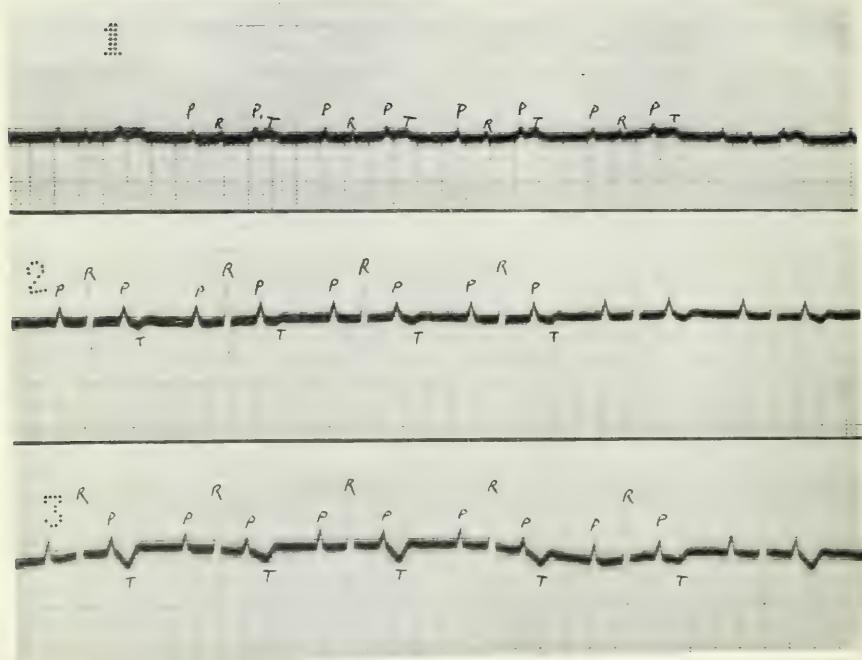
Partial heart block: the ventricular waves occur only after every other one of the auricular waves; two to one rhythm.

Heart block is proving in several people to be compatible with a fair degree of efficiency—in some very old people and some very young people. Mr. L. S. F. H., a Civil War veteran, is carrying in his old age without very much discomfort a heart which gives the electrocardiogram shown in Fig. 5. At times the block is complete and at other times partial. A small amount of digitalis, apparently, is all that is necessary to make the block complete.

In Fig. 5 the auricular waves marked P occur quite regularly at a rate of 60 to the minute, while the ventricles contract quite independently of the auricles, as shown by the ever-varying relation of the P waves and the waves R and T, which are due to the ventricles. The ventricular rate is 33 to the minute. This independence of the auricle and ventricle is a sign of a disease process in the path between these chambers, the path along which the stimulus which the auricle sends to the ventricle must travel. An interruption in this path is known as heart block because the stimulus is blocked in its passage and results in a condition such as we have just seen, with the auricles and ventricles beating independently.

L. P. B. H., a child six years old, was referred to me by Doctor Frank Miller for an opinion as to whether he could subject him to tonsilectomy. A slow heart was discovered three years previous and a murmur was said to have been noticed when he was two years old. The child did not appear in any way to be ill and was allowed to have his operation.

The electrocardiogram, Fig. 6, shows that heart block was present in this case. The auricles contract quite regularly at the rate of 100 a minute and the ventricles at just half this rate, for there are two auricular waves, P, to each group of ventricular waves, R and T. First an auricular wave is followed by the ventricular group and then an auricular wave occurs alone; the next P wave is followed by R and T, and so on. This is because the disease in the muscle is not severe enough to cause a complete dissociation of auricle and ventricle as in the last patient, but is still sufficient to cause every other auricular stimulus to fail to arrive at the ventricular muscle.

There are several examples of mitral stenosis complicated by auricular fibrillation that have shown remarkably few symptoms considering the gravity of the condition. Mrs. F. D. D. S., thirty-

nine years old, the mother of three healthy children and who for the
past few months has been compelled to do her own housework on
account of lack of servants, presented herself looking not at all ill,
but saying that she had heart trouble and wished to be taken care of.
Her heart was enormously large, as shown by the accompanying X-ray
photograph, and there was complete paralysis of the auricle.   It is
hard to believe that a heart so badly involved could be so completely
compensated, but such is the fact. and she is able to live a fairly
comfortable life.

THERAPY OF PULMONARY TUBERCULOSIS

By MAX BIESENTHAL, M.D.

Chicago

DURING the interne service here in the County one is likely to get the impression, as one goes through, that the treatment of pulmonary tuberculosis is almost limited to the signing of death certificates. This, of course, is true here owing to the fact that our tuberculosis hospital was built only with the idea of admitting the far-advanced pulmonary cases.

Now as you go out, assuming that you go into general practice, you will find that tuberculosis occupies quite a part in the field of internal medicine. That can be readily understood when you take the statistics from the so-called registration area where, in 1916, one death out of every seven was due to some form of tuberculosis.

So that the question of treatment of this widespread disease, as far as you people are concerned, must be left untouched in the eighteen months of your service. When you leave here and get out you are going to come across these cases, it will be up to you to decide just what you should do with each individual case and just how you shall handle both the family and the patient.

The first problem to be considered in the treatment of tuberculosis —when I speak of tuberculosis this evening I limit myself entirely to the pulmonary form—is the question of preventive treatment. It is in this field that the greatest amount of work has been done by various organizations, by various communities, by various nations. There was a feeling that in time tuberculosis was going to be eradicated as one of the diseases of the human race.

In the period from 1850 down to about 1914, at the beginning of the war, tuberculosis had declined about fifty per cent. in the matter of morbidity and mortality in most of the so-called civilized nations of the world. After the beginning of the war, owing to conditions of which we will speak later, the mortality and morbidity began to rise;

so that the last statistics of 1916 for Germany showed an increase in tuberculosis already at that time of about fifty per cent. Now, this increase in tuberculosis has been more or less universal, throughout the world. And it is a condition not dependent upon whether that nation had entered the world war as an active participant or not. For instance, down in South America, the Argentine Republic, their statistics on the existence of tuberculosis had risen almost one hundred per cent. within three years after the beginning of the great world war. Other factors than the mere question of active military service have been given for the making of this great increase in the existence of tuberculosis; so that we are again back to the problem of prevention of tuberculosis.

In this problem, we are guided to-day by two principles. Both of them, it is true, are based partly on practical knowledge and partly on theory. First, we believe rather universally that tuberculosis is acquired in childhood, and we might even go beyond that and say that our tuberculosis is acquired early in childhood. In other words, we have found by the work done with the tuberculin reaction that by the time the child reaches the age of fourteen years, practically all children in this country have become infected with the tubercle bacillus. Second, we know, or feel that we know, that tuberculosis as a clinical manifestation of adult life is simply the awakening of the so-called childhood infection, or endogenous infection we might call it; a disease resulting from the acquisition of the disease acquired in childhood.

Now for the theory. Why should certain of us develop clinical tuberculosis at the age of twenty, twenty-five or thirty—about fifteen out of every hundred? And why should the eighty-five others, who unquestionably have become infected, escape? Therein comes the great problem, the great theoretical problem of tuberculosis. It is along these lines that we are attempting to do the great work in the prevention of tuberculosis. For instance, I believe it was in 1910, various antituberculosis organizations in this country had the slogan, " No tuberculosis by 1915." Another of the slogans by which they attempted to eradicate the disease was, " No spit, no consumption."

We know to-day, about this " no spit," that it is of the greatest importance that we should not allow the dissemination of the tuber-

cular sputum around children. We know positively that a child at
the age of six months or one year coming in contact with a tuberculous
parent, nurse or any relative, has got one chance out of ten of escaping
a very early death from some form of tuberculous infection. The child
at the age of six months or a year receiving such a massive dose of
tubercle bacilli, has not the resistance to withstand the toxine, has
not the ability to form the counteracting agents needed, and the
child dies.

It is by this method of preventing the dissemination of sputum
on the one hand ; and, on the other hand, attempting to improve certain
conditions of the adult, wherein lies the future possibility, not of
eradicating the invasion—which probably always will be, or for many,
many centuries will be, present—but of eradicating the clinical disease.

In the matter of invasion comes up the question of marriage. Back
in " The Dark Ages," when I studied medicine, it was strongly
believed that tuberculosis was an hereditary disease; and your father
and mother having had the disease, that you were going to get it simply
by the passing on from them to you. We know better to-day. We
know that tuberculosis is not an hereditary disease; that the actual
transmission of the clinical disease from the father or the mother
to the new-born child has probably never been recorded in medical
literature more than a half dozen times, and those cases are open to
question. But what we do have are two factors. The first is the
transmission of disease from the mother or father to the infant; and,
second, the transmission from the mother or the father of an inherited
weakness, which makes it impossible for that child to withstand the
many diseases with which it comes in contact as days go on.

That is one factor in the question of marriage in connection
with tuberculosis. Second, is the question of disseminating the dis-
ease by the formation or transformation of what we know to be an
inactive case into an active one. That has its greatest bearing
on the question of tuberculosis in women when the question comes
up about marriage. It was formerly thought that pregnancy
was of a beneficial character to a woman suffering from tubercu-
losis. It is known that a woman, during the period of preg-
nancy, does improve as far as her general condition is concerned. We
do know also, as soon as the baby is born, this pulmonary tuberculosis
lying dormant during the period of gestation awakens as an acute

form and produces the death of the woman.   As to preventing clinical tuberculosis, we can prevent that disease by some wholesome advice on the question of marriage to individuals, especially women, when we know them to be actually tuberculous.

In the treatment of this disease there are certain factors which come up that might be classed under personal care of the patient in attempting to eradicate the clinical manifestations.   First, comes the matter of personal cleanliness.   It is surprising the number of cases one sees in a community like Chicago, in which a diagnosis of tuberculosis has been made, where the patient takes it for granted that they must never bathe again.   It is surprising the number of cases one sees in a city like Chicago where, as soon as the diagnosis is made, they assume that certain other agencies of personal cleanliness need no longer be observed.

There is no reason why, in a case of pulmonary tuberculosis, unless the case is absolutely bedridden, he should not be compelled to take his weekly, bi-weekly, or even tri-weekly bath.   The only thing probably not in order in these cases is water that is too hot; nor is it wisdom on the part of tuberculous cases to take the popular form of bath known as the Turkish or Russian bath.   That should be contra-indicated in all cases you have.

Another form of personal cleanliness not observed—occasionally through ignorance and occasionally through an effort on the part of the patient to conceal the disease—is the matter of swallowing their own sputum.   In the insane and in children of rather tender years we find practically always that the patients will not expectorate. On the other hand, we find individuals who are working, who are living in boarding houses or associated with other people, who, knowing they have this disease, rather than expectorate and raise a suspicion that they may be consumptive, swallow their own sputum.   It is to this swallowing of the sputum that we attribute a considerable number of the complications that sooner or later arise, either tuberculous enteritis or the inflammatory conditions not tuberculous of the intestines.

Now as to the personal element and the personal care of the patient in regard to their medical advice.   I don't know of any condition with which I deal in internal medicine that requires more tact, more talking and more lying at times than does the handling of a case

of tuberculosis.   The physician who can handle a case and inspire the confidence of the patient at any and all times is the man who has the greatest success in treating his patient.   The man who can examine his case, and, in the right spirit, tells the patient that he has tuberculosis and yet states it to him in a way to make him feel that tuberculosis is a disease and, like many diseases, simply needs treatment; that it is a disease from which, with reasonable care and ordinary intelligence, each and every one of his patients get well—that type of man succeeds.   The moment that these patients get the idea that they are going to die, they die.

Now, this is something that is very peculiar.   I have seen patients in the hospital, in the early stage, say, "Now, doctor, I know I am going to die."   You examine him.   All the physical findings and all the symptoms point to a recovery or at least a retardation of the time of death.   They simply come to die; and it is not long before they die.   That type of patient, fortunately, is rare.   The majority of cases are of the hopeful type, ever feeling they are going to get well.

There is no reason for any man in the handling of cases of tuberculosis to deny the existence of that specific disease after he makes his diagnosis.   This feeling, on the part of some of the public and on the part of some medical men, that it is a wiser thing to tell your patient that he has a cold or a spot on his lung or some such excuse for fear of scaring the patient or producing some bad mental state, is wrong.   In the first place, to do that with your case, you are going to find one of two things.   As time goes on and the patient does not take care of himself with that degree of care he will take if he knows what is wrong with him, he gets worse.   He will finally land with some doctor who will tell him that he has consumption.   He will come back and say, "Doctor Jones said I had a cold," and you will be criticized for being ignorant.   Or, if you simply don't tell him, you are not going to give him the same opportunity to get well; because, feeling that he has simply a cold, which does not require the same amount of personal sacrifice, he does not care for himself as he would if given a real diagnosis of tuberculosis.   On the other hand, never discuss it with the patient.   Just stop there.   Make the diagnosis of tuberculosis and let it go with that.   But at all times tell the members of the family that are most interested in your patient the exact truth.   If you believe that from your experience and the experi-

ence of your hospital days that such and such a case is going to die, don't give a hopeful prognosis simply because you feel you want to hold the case. If that case dies within a week or two weeks, you are going to be censured by the family and they live on after your case has died and they will never forgive nor forget.

In the treatment of this disease there have been varied shades of opinion on the question of exercise and on what has now come up as the result of our war work—the question of occupational therapy. There was a time when the diagnosis of tuberculosis carried with it the impression that each and every patient so afflicted must rest twenty-four hours in the day and that this rest must continue *ad infinitum*. " We got a patient; he was put at rest; not permitted to walk around; was in bed all day or in one of these nice, soft roomy chairs." The case improved. He got fat. And then came the day when that man left the institution. That type of man went out and went to work and shortly broke down. He was not built up. He was fattened, and that was all. So there gradually came a change in the views as to the relationship between rest and the treatment and the question of exercise.

This work was first done by a Doctor Patterson, of England. He took his sanitarium patients and put them through certain forms of exercise. I believe he started with walking half a mile, then a mile; and by the time Patterson got through with his patient, when he got to a point where he believed the patient was ready for discharge, that patient was doing a full day's hard work. After the work of Patterson was announced to the world the tuberculosis sanitariums began to swing about to the other extreme. I believe that there were many patients hurried on to their graves simply by over-exercising when the individual should have been at rest, by not observing certain basic principles, that, strange to say, were laid down by Patterson himself— that temperatures, rapid pulse, dyspnœa on the least exertion, were not indications for exercise, and that those patients should be kept at full rest until such time that they could meet with the views as laid down by him.

Here until the beginning of the war we were going along at a happy medium in the way of exercise. Our temperature cases were kept flat on the back in bed. The cases that had a normal temperature in the morning were allowed a very small amount of exercise and

we gradually worked them up to such time they could do a fair day's work. As a result of the war and the development in the army of quite a large number of tuberculosis cases, there developed the application of so-called occupational therapy in tuberculosis. We began to learn that a certain class of patients which we had kept absolutely at full rest could do a certain type of work, what might be termed a certain type of exercise, not with harm but with marked benefit.

In the various tuberculosis hospitals, even a patient running a temperature, instead of lying in bed and gazing at the four walls of the room or being permitted to do nothing but look out onto a lawn, was put at light work. This light work usually consisted of a little bead work or basket work or knitting or some such form of exercise. They are permitted to work five minutes and then rest; and probably work an hour or hour and a half a day. What has this done in the way of treatment of tuberculosis? No longer does he lie there with no thoughts but thoughts of his disease. He has something to keep his mind off the feeling of what is going to happen to him. And the men who are in charge of these various government hospitals will tell you that the trouble-makers disappear and instead the same individuals become the best of patients. Furthermore, and what is almost beyond understanding, instead of being of a harmful effect, this mild or light form of exercise was beneficial from a medical standpoint. Temperatures became lower, the type of pulse and the rate of the pulse became better, and the patients began to gain more rapidly than they did formerly. It was not the exercise that did this. It is purely psychic. It has given those poor lads a hold onto something at a time they believed they were through.

Any of you who have been in the service and have served in such hospitals as the government had in North Carolina or Base 21 at Denver, have seen the farmer boys and lumber jacks knitting. Who ever thought of the possibility that some husky six-foot teamster could enjoy knitting a sweater? You would be amazed at the work and the good work done in this kind of occupational therapy in the treatment of tuberculosis.

Now from this light form of exercise, of course, we have gone on, and instead of the type of exercise as originally laid down, we have developed to-day occupational training. We take young girls for certain periods of the day and teach them stenography, domestic

science and such; and the men, telegraphy, automobile **repair work**, carpentry and printing trades, etc.; giving each one of these **men and** women a training, a training which is not only taking care of themselves as far as the disease is concerned, but secondly, a training in something to put them on their feet and give them an occupation when they leave the hospital. For, after all, one of the difficulties in sanitarium work in private practice has been this—that a man got sick, he went to a sanitarium, and when he got out he didn't know what to do. He either felt he must not return to his old occupation or was told he could not and that he should get out and do some light outside work. Most of these men found out two things: One is that light outside jobs were rather rare; and second, when they did procure a light outside job, they made very little money; and consequently, the impoverished condition of their finances caused their disease rapidly to recur and they again had to enter the institution. This existence went around and around in a circle and you would see patients come in and go out, come in and go out, until the final settlement.

When the Naperville Sanitarium was established in Naperville, Illinois, patients got their breakfast seven-thirty to eight; at ten o'clock, milk and crackers and cake; twelve o'clock, dinner; three o'clock, some more milk, more crackers and cake; six o'clock, they had their supper; and before going to bed, some more milk and crackers. In other words, they were fed six or seven meals a day. At that time, this was the recognized method of procedure, when it came to the question of diet in tuberculosis. Patients were fed in the belief that the more you could put into a patient the better it was. You would hear the men at the various tuberculosis meetings boast that they had a patient who could take six quarts of milk a day and twenty-four eggs. But they did not come back and tell you what became of the patients afflicted with what we know was almost criminal super-alimentation. We have grown away from that; and, instead of having our patients fattened and having the disease progress and progress, we have got to a basis of three meals a day for the majority of patients.

I only know of one institution in this country to-day that feeds between meals; and the reason they do it there is because a lay member of the executive board believes that it is the right thing. The **doctor** hasn't anything to say. The rest of the institutions feed simply,

breakfast, dinner and supper, with the exception of the very sick cases, and those cases that come in markedly emaciated. They get an extra ration of milk. Very few institutions to-day give their patients over four or five glasses of milk in the twenty-four hours. Practically no institution to-day gives their patients over two or three eggs a day. Occasionally this egg question is brought up by one or two men who believe in half a dozen eggs. As you take the run of institutions and the run of men in practice who devote themselves to this disease, you will find a couple of eggs a day and four or five glasses of milk a day constitute the average diet as far as eggs and milk are concerned.

As to the rest of the diet, I always tell my patients simply to take a straight family diet, meat, potatoes, butter, vegetables, fruit. The only thing we don't advise them to take are foods containing a large amount of seasoning or foods that contain a large amount of substances made with vinegar. You will find that sour foods act badly in your tuberculosis cases; and yet it is a strange thing the number of them that crave, as in all anæmias, for something sour, very, very frequently.

When you make a diagnosis of tuberculosis, one of the first questions that come up is what you may do with the case. And here comes a part of my talk this evening that I want to spend the most time on. You have made your diagnosis. Now, what are you going to do with your case? It all depends on, first, the condition of your patient, and second, the condition of his finances.

First, we will assume that you have diagnosed a case as an incipient case with positive sputum in a man or woman that has a young infant in the family. Now as I have spoken before on the question of prevention, there is only one thing to do with that case, send the patient away, unless the opportunity arises—which does not arise very frequently—of sending the infant away. One of the two must absolutely be done in justice to the child, in order that the child shall not be subjected to an early death simply because of stubbornness on the part of the patient.

Now what are you to do with your incipient case you have to send away? Where are you going to send it? If your case is well provided with money; if your case is of the type that will acclimate itself to strange surroundings; if your case, from the time it leaves your hands, knows just where it is going; if your case is going to be

put into the hands of somebody competent to look after it, after it leaves you; I sort of feel that that case is about ten per cent. better off in a western institution or under the care of a good western or southwestern man than if he stayed at home, assuming you are practicing here in the Mississippi Valley. But you will find, as you go along, that the number of cases of this kind that meet this hypothetical one are very few, and that if you follow the rules of men in this line you will find that the longer you stay in the work the less will be the number of cases that you will send away.

This old idea of seeing a case and making a diagnosis and never going into the question of their social condition, their financial condition or interests, and simply feeling that the diagnosis of tuberculosis meant to go home, pack up your trunk and get out West as fast as you can—this type of advice has probably killed infinitely more people than it ever cured.

We will assume that your case is moderately advanced, one with a fairly active lesion, having a fever. Should that case go away or should it stay home? If no children are in the family and the patient has a home well-fitted to meet the demands for treatment, an open sleeping porch and proper food, you will find your case will do as well at home as in any institution. But you will find that the number of this type of individual who will live up to the rigid regime needed for them to get well living at home are few, and that many of them, and probably most of them, need a course of treatment at a sanitarium, not that the sanitarium has anything miraculous within its walls for the cure of tuberculosis but simply that the sanitarium gives him his A, B, Cs. It gives him his education. It shows him there are others sick with the disease and, second, it teaches him everything that he will need after he leaves and again returns to his home. It is in this field, I believe, that the tuberculosis sanitarium has its greatest value.

Aside from the question of segregation of cases to prevent the spread of the disease among children, if you have a case far advanced, active symptoms, high temperature, elevated pulse, irrespective of the question of finances, irrespective of any other question, never send a case West. That case, in all probability, will die sooner as the result of the trip than it would had he remained at home or in a local institution.

Next, we will assume you desire to educate your patient; that you desire to place him in a sanitarium and that he has some money, that your patient and the patient's family believe he can go West, and it is up to you to decide, in a borderland case, as to whether he or she should go or not. At the present time, you want to feel as I do in this matter. An incipient case needs six months to a year to get well. Never do as so many doctors do to me and say to the patient, " You go up and see Doctor Biesenthal and have him send you to a sanitarium and you will be all right in six weeks." If you have a case that will be all right in six weeks, he hasn't got tuberculosis. You have to figure on six months to a year. You have to figure to-day that your patient must have available for his maintenance in the West about two thousand dollars if he is going to be away one year. He must have this money so that if he goes, the family will not be made to suffer as the result of any sacrifice on their part. Now, there is nothing, I believe, in the tuberculosis work, from the social end of it, that is worse than a family being told that their son must go to Colorado or New Mexico or California, and they put a mortgage on their home and simply pauperize themselves to send some poor chap away while they starve, some poor chap who probably had no chance of getting well if he stayed at home or went away. That type of advice from those of you who go out should never be permitted.

Don't become imbued with the idea at any time, whether you are living here in Chicago, or any place in this valley, or if any of you think of going West—with the feeling that all you need do is to send a consumptive to the city of Denver and as he steps off the train at the beautiful Union Depot, he need take but one long breath of air and he is well. There are more boys who come back in the baggage car out of that Union Depot at Denver that have gone there for their health than probably come back in Pullmans. It is strange that this is not generally known.

It is strange that to the profession at large it is not known that Colorado to-day has a larger death-rate from tuberculosis than any state in the Union. Not that native Colorado people die. They are the natives of New York, natives of Ohio, etc. They make up the death-rate for the State of Colorado.

One great difficulty in the treatment of tuberculosis is the fact that we have no specific treatment for this disease. Back in 1890,

Robert Koch gave to the world his work in the production of his tuberculin, and immediately went forth the feeling among university and medical men that at last we had a cure.

In fifteen years, I have gone through three distinct waves of enthusiasm and three equally distinct waves of mental depression as far as tuberculin is concerned. To-day I believe that practically every tuberculosis worker in the United States is agreed upon one point, and that is that tuberculin as a specific agent in the cure of pulmonary tuberculosis is absolutely valueless; and that, on the contrary, instead of being aided, there are cases where tuberculin does harm; that it aids in the production of hemorrhages, and that as a result, instead of helping your patient you place him on the downward path. Now I know that there are men, even men right here in the enlightened medical centre of Chicago, who use tuberculin by the barrelful; believe in it absolutely; believe in it honestly; and yet at the same time you peruse the medical literature of the last two or three years and you will find that the opinion that I have just given you on the question of tuberculin is about the last word there is.

From time immemorial there have been various drugs used, various drugs announced as cures for tuberculosis. Now there is one thing that is peculiar about the drug therapy of tuberculosis and it is something that has been thrashed out by experimentation, not on the guinea-pig but on the human. If you go into a sanitarium and tell your patients you have a new cure for tuberculosis, it doesn't make any difference what it is, they begin to use that drug; there is a psychic element involved and immediately a large number of your patients begin to improve under the so-called new tuberculosis cure.

I don't know if any of you boys or girls remember—but about seven or eight years ago there was a man by the name of Friedmann came over from Germany and he had a cure for tuberculosis. He had them flock to him by hundreds in New York and appeals were made from all over the United States—wouldn't he come and treat them or send some of his treatment? Reports came forth of most marvelous improvement in his tuberculosis cases as the result of the so-called treatment. It takes time to judge any cure and this is especially true of the cure of tuberculosis. It was this psychic element that I have mentioned that was unquestionably the basis for the sanguine reports that came forth from the State of New York as to the

value of the Friedmann serum. Only about two years ago there came
the last word from the United States Public Health Service branding
the Friedmann serum as absolutely valueless in the treatment of tuber-
culosis. Another great remedy gone flat on the rocks; and so it has
been. Everything has been advised in its time.

The list of remedies in the books for the treatment of tuberculosis,
in any materia medica, I believe is longer than for any other disease.
Chief among these are three. First comes creosote. Strange to say,
while the belief is rather universal that creosote as a curative agent in
tuberculosis is of no value, there seems to be gradually coming again the
feeling that certain forms of creosote are of some value. They are no
longer claiming that all you need to do with a case of tuberculosis is
to give three or five minims of creosote in a capsule three or four times
a day and the case gets well; but creosote medication will help certain
phases, certain symptoms in tuberculosis.

Second, comes the question of the use of cod-liver oil. It was
believed there was some substance in cod-liver oil that had some specific
action on tuberculosis. It was used in private practice to the point
that each and every case developed gastritis as a result of its over-use;
and gradually cod-liver oil was dropped. Yet we know that cod-liver
oil to-day possesses some value; that cod-liver oil did contain some
agency that had some beneficial action on tuberculosis.

Now the trouble with both of these is that they were done to death.
If we were to strike a happy medium we might strike a fairly good
aid in the treatment of a certain number of our patients.

Now the third drug that has been used, praised and condemned
are the iodides. To-day you read articles by men most able in their
work who absolutely condemn the use of the iodides in any form;
and the next day you will pick up an article by an equally good man
and he will tell you you can use iodides. Unless you have had some
experience of your own, you wonder just who might be right. There
is in my mind no question that the use of potassium iodide, sodium
iodide and all the iodide salts is to be advised against in the treat-
ment of tuberculosis. My views are based chiefly on the results
obtained here in this hospital in work done by several of the attending
men from the use of iodide of potassium in combination with other
drugs and the use of tincture of iodine, in the hope they can cure
tuberculosis. My experience is that potassium iodide acts in the same

way as tuberculin with the exception of the so-called local reaction. You give potassium iodide and you get an increase in the physical findings of the case—increase in temperature, increase in most of the subjective symptoms of the patient. If you had a case previously inactive and give iodide you change the inactive case into an open case, and into an open case that rarely ever becomes again a closed case. This you have done; you have made what may have been a quiescent lesion a real active clinical tuberculosis. I don't believe any of us have a right to do that. We have seen over here in the morgue, cases with old lesions who for some reason or other had been given potassium iodide, and you could see spreading from the old fibrous lesion acute tuberculosis lesions in the ramifications of the lung. Now, the post-mortem findings in not one case but innumerable cases have absolutely convinced me that the advice of giving potassium iodide even in fibroid cases is very bad practise.

Now as to tincture of iodine. There are several men in Chicago, and one in particular, who give tincture of iodine in ascending doses for tuberculosis, claiming good results. I have seen some of these good results posted. I want to say that if I ever have tuberculosis the last thing anybody will give me will be tincture of iodine.

Well, we can't use tuberculin, and we can't use creosote, and we can't use cod-liver oil, and we can't use the iodides. What can we use? Should we be drug nihilists when it comes to the treatment of tuberculosis? No. Drugs have their place in the treatment of this disease. Drugs have their place in the treatment, not of the disease in the main, but in the treatment of the symptoms.

First, as to cough. Very frequently we must do something for the cough in consumptives. Many a morphine fiend has been made out of a chap with the incipient disease, so that his morphinism is far worse than ever was his tuberculosis. I have always felt in a consumptive with a cough the thing to avoid is the use of any of the opium derivatives if at all possible. It is with these coughs I have found that one of the creosote derivatives plays a big field. Guaiacol albuminate will frequently help coughs as far as drugs are concerned rather than some preparation of morphine, codeine or heroin. At other times simply the use of bromides will aid. Simple education, asking the patient not to cough, will aid more than will any of the forbidden remedies under the Harrison Narcotic Act.

One of the reasons why medical men in institutions quit their work is a question of pain in tuberculosis. With practically every case of tuberculosis of long standing we are dealing with a case of tubercular pleurisy, usually of the adhesive type, and each time the weather changes, each time there is a little extra exertion, or occasionally without any provocation, these patients will complain of pain. Here again I want to warn you—keep away from opium. If you do not, you will find these pains will gradually increase in severity in the minds of your patients. The best way to treat pains is to explain why they have them. It is rare these pleurisy pains are of such intense character but that the patient can bear them even without treatment. Very often the simple application of tincture of iodine to the chest will banish the pain. Occasionally strapping will help. I find one of the three—talking to them, iodine and strapping—takes the place of the old quarter grain hypo.

Night sweats is another one of the symptoms that is most difficult to treat. The most popular remedies we have are: First, $1/100$th of a grain of atropin at bedtime. Very often that is all you need. Sometimes two or three tablets three successive nights and the night sweats disappear. Again, they will disappear for four or five days; only to return. We have agaricin, $1/6$ of a grain. Camphoric acid, in doses of 15 minims.

At times, nothing helps. It has been advised to keep away from drugs in night sweats. Attempt to determine the time at which the patient sweats; wake him up previous to the sweating, give him a hot drink, and a sponge, and the sweats will disappear due to the change in the regime of the patient's sleeping and waking.

One of the most harrowing things and the one thing in tuberculosis that may kill or may help your patient is a hemorrhage. In the minds of the public, a hemorrhage always means death. But we know, from the standpoint of statistical experience, that only about two out of every hundred of the patients that have a hemorrhage die as a result of the hemorrhage.

What to do for hemorrhage cases? Here again I wish to speak against what is to-day the accepted form of treatment for pulmonary hemorrhage, and that is the injection of a quarter of a grain of morphine as soon as you can. In my work here in the County and in my private practice, I never permit the use of morphine in hemorrhage.

I am getting more benefit without morphine than I ever did with it. Use moral suasion. Use ice to the chest. You can use emetine hydrochloride about three-fourths of a grain, repeated three or four times a day, if your hemorrhage is small. If your hemorrhage is a large one, I believe the best remedy is a horse serum, or one of the concentrated preparations put on the market by the various houses under various names. You will find in most communities in which you practice that you can get horse serum when you can never get the other preparations. If you are in a quandary on the question of the choice of death from the anaphylactic action of the horse serum and death from hemorrhage, my advice is to give horse serum. If the patient should unfortunately in those rare instances develop anaphylaxis, then at least I have had the satisfaction of giving him what I believe is the best treatment for the worst types of hemorrhage in tuberculosis.

I just want to speak on one other symptom in the treatment of tuberculosis among others that come up. One is the question of diarrhœas of tuberculosis. There is almost nothing that can surely kill your patient quicker than can the continued diarrhœa of tuberculosis. This is strange, as so many of these cases are amenable to treatment, amenable to such types of treatment as are laid down for these diarrhœa cases—giving these patients large doses of paregoric—opium—and, a drop or two with each dose, of creosote. Here, for instance, is one place that creosote seems to have almost a selective action, when coupled with other drugs. I have seen cases where it did not stop the pulmonary lesion but it did stop the fatal diarrhœa, and it stayed away until the case terminated as the result of the pulmonary disease.

Next is the question of the tuberculous larynx. There are cases of this type that unquestionably get well. They usually get well as the result of the general care of the patient. I have never seen one get well. I have seen throats that have been sprayed with all the preparations that our friends in laryngology use. I have never seen one get well as the result of that treatment. I believe that the ordinary treatment of rest, fresh air, diet, with medication to aid, such as a cocaine spray, will do as much for the case as anything.

Recently there has been devised a set of mirrors for the reflection

of sunlight into the larynx. The few cases I have seen, only three or four, all succumbed. In spite of the fact that so many of our cases die, we know from post-mortem experience that there are cases— while they succumb to their pulmonary lesion—at the same time have had a laryngeal lesion, and that got well and did not go on until a pulmonary lesion terminated the case.

When the X-ray first came out, of course it was used for almost everything possible. One of the earliest recommendations for the therapeutic use of the X-ray was in the treatment of pulmonary tuberculosis. I believe, as far as I can think now, there is only one man in the United States, a man in Denver, who still believes that the X-ray is good for tuberculous lungs. The experience of men who have done any work with the X-ray is that instead of improving your case, your case begins to go down hill, just as I believe happens in the administration of potassium iodide.

There has also been recommended in the treatment of tuberculosis—radium. Up to the present time I know of no statistics to prove or disprove its value.

In Switzerland, Doctor Rollier has done some of the most interesting work in relation to tuberculosis in children with heliotherapy, using the method of exposure of portions of the body for periods of time, gradually increasing the periods as the patient becomes accustomed to it, exposing them to sunlight. We know when we expose our patients indiscriminately to the sun's rays, instead of improving in the open air they do badly. They begin to run an increase in pulse-rate and begin to run a temperature. Under the newly created form of heliotherapy, as practiced by him in his sanitarium at Switzerland, he has obtained cures, and others have since used it with very good results in tuberculous lesions other than pulmonary. The results so far in the pulmonary type of the disease have been encouraging to a lesser degree.

And yet there are in America at least a dozen different kinds of lamps for artificial heliotherapy in tuberculosis. I have seen them used. Up to the present time I have never seen any result comparable with either the price of the machine or the time you put in in your work.

Now last comes the question of surgical interference in tuberculosis. There have been various operations proposed for the cure of

tuberculosis. Surgeons, especially from Germany, have attempted to improve lung conditions based on the theory of its causation; and they have done osteotomies in the hope that they can broaden out a chest by loosening up the ribs, and that the patient will be cured as the result of the increased thoracic capacity.

One of the last operations announced just previous to the onset of the war was a plastic operation, supposed to be done for unilateral cases, resecting practically every rib on a side and permitting that side to fall in. There was only one trouble with this operation. The patient never lived long enough to see if it would do any good. However, we don't hear any longer of this most radical type of chest surgery.

We have one form of operation work that has to be classed as surgical that has done a certain amount of good. That good is even to-day not fully understood and more often probably misunderstood, and that is the operation for the procedure of artificial pneumothorax, a method of immobilizing the lung by the injection through a needle of either air or nitrogen gas. This work was originally done by two men, one an Italian and the other our own John B. Murphy. The procedure was based on the surgical work of immobilizing the joint. If you got a joint at rest it was of far more value than incising and doing a resection.

The indications for artificial pneumothorax are usually given as a unilateral disease; or, if the disease is bilateral, inactive on one side; and that the patient should not be desperately ill; that it is best done in young individuals. And the last indication—if you can decide from which lung your patient is having the hemorrhage—pneumothorax is the treatment par excellence. That is true and works out beautifully if you know from which side your patient is bleeding; but only too often you have your hemorrhage from just the opposite lung that you believe is effecting the hemorrhage; and as a result, your pneumothorax work fails.

As contra-indications for pneumothorax mention should be made of diabetes, laryngeal involvement, kidney involvement, and it should not be done on people beyond a certain age.

The value of pneumothorax work, put briefly, I believe is more as a palliative value than as a real cure. Occasionally we see individuals who, following artificial pneumothorax, make a wonderful recov-

ery.   But you must also remember this axiom in tuberculosis, that you can prove that almost anything cures pulmonary tuberculosis if you limit yourself to a few cases.   What pneumothorax work really does do, is to prolong life.   It alleviates some pronounced symptoms, such as cough, fever, excessive expectoration.   I always have felt toward pneumothorax, that if it does just that, it has done considerable, because if we do that where many other things have failed, we have done a great deal.

A SURGICAL CLINIC

AT POLYCLINIC HOSPITAL

By P. G. SKILLERN, JR., M.D., F.A.C.S.

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I. ACUTE INTESTINAL OBSTRUCTION: (1) ENTEROSTOMY; (2) ILEO-
CECOSTOMY; (3) RESECTION AND END-TO-END ANASTOMOSIS. PRO-
CAINE ANÆSTHESIA.

THE following case strikingly illustrates the power of local
(procaine) anæsthesia to snatch a very sick patient from the jaws
of death.

L. I., female, aged thirty-six, cook, was admitted to Polyclinic
Hospital on March 13, 1919.

Chief Complaint.—Acute pain in mid-epigastric region.

History of Present Illness.—One week previous to admission the
patient was seized with a rather violent pain in belly while at work.
This pain was of colicky type and became rapidly more and more
severe until the patient was no longer able to stand erect. The pain
was characterized by remissions and exacerbations. The patient was
not definitely nauseated, but succeeded in inducing vomiting shortly
after onset of pain. Two hours after onset of attack she had an
apparently normal bowel movement, but has had no other up to time
of admission. She took laxatives and purgatives only to aggravate the
pain, which rapidly became unbearable. She was plastered and
given all sorts of medicine by mouth, without effect. She called a
physician, and more purgatives were prescribed. She became weaker
and toxic, and the pain spread throughout the entire abdomen. Three
days later she began to have vomiting of a distinctly intestinal char-
acter and projectile in type. She became weaker and was admitted
in a state of toxic shock (temperature, 97°; pulse 120) with dis-
tended, board-like abdomen, pulse rapid and thready and clammy skin.

Previous Medical History.—As a girl the patient had vague
uterine trouble. Within the past six years she has had four attacks
of " acute " indigestion, in which she suffered acute pain in ab-

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domen and nausea. Three years previous to admission she was operated upon at another hospital for appendicitis and uterine fibroid, for which appendectomy and hysterectomy were respectively performed: post-operative menopause was effected. She is not habitually constipated. The patient had one child, which died at age of two years. She has had leukorrhœa since her marriage.

Physical examination reveals patient in a precarious condition. Her pulse is weak and thready, her skin is clammy, her pupils are dilated, her abdomen is tense, distended and tympanitic, and her vomiting is projectile and stercoraceous in type. She is moaning and in great pain.

Operation No. 1 (March 13, 1919, 5 P.M.).—Infiltration-conduction anæsthesia, using one-half of one per cent. solution of procaine. Left-sided McArthur-McBurney incision made, loop of greatly distended and thinned-out ileum drawn into wound and opened: a large amount of fluid fecal matter and gas was drained off. A No. 12 F catheter was inserted in opening. Another opening was made for drainage in opposite direction. Wall of gut very soft and readily punctured. Wound left remaining unsutured.

Post-operative Notes.—Directly after operation the patient was placed in upright Fowler position, external heat was applied and proctoclysis of sodium bicarbonate (3 per cent.) was administered. The pulse was weak and thready. At 7 P.M. the electric pack was applied and foot of bed elevated.

March 14th: Pulse somewhat better to-day. Hypodermoclysis of normal saline, 400 c.c. under each breast. Free discharge of fecal material from tubes.

March 15th: Pulse stronger. Enteroclysis of normal saline begun. Patient is being fed liquids. Fecal material discharging freely from wound.

March 17th: Drainage tube removed from Douglas's pouch. Patient weak. No signs of peritonitis of infective type. Enteroclysis given through openings in valve. Catheters removed. Enterocylsis per rectum of normal saline and sodium bicarbonate (3 per cent.) continued.

March 18th: Cigarette drain removed from left iliac fossa. Enteroclysis of hot normal saline given through openings in gut.

March 19th: Hypodermoclysis of normal saline, 800 c.c.   Enteroclysis of hot normal saline given through openings in gut.

March 20th: Hypodermoclysis of normal saline, 500 c.c.   Gut irrigated with hot normal saline.   Patient much improved; she has been partaking of food, is stronger and is free from pain.

Operation No. 2 (March 21, 1919, 10:30 A.M.—eight days after first operation).—Preoperative anti-shock intravenous infusion of normal saline, 250 c.c. with adrenalin 1 to 10,000.   Infiltration-conduction anæsthesia of procaine, one-half of one per cent.   Incision made through inner half of right rectus from navel to symphysis. Site of obstruction located deep in pelvis, where intestines were bound down by dense, fibrous adhesions.   It was impracticable to attempt to release the bowel from the constricting bands; the ileum between the site of obstruction and the cecum was flat and ribbon-like; instead, the obstruction was short-circuited by performing ileo-cecostomy by the double-layer suture method—lateral anastomosis.   Anæsthesia was very complete.   Patient left table in a moderate state of shock.

Post-operative Notes.—When patient was returned to bed external heat was applied by electric pack and hot water bags; fluids were given freely—hot sodium bicarbonate solution by bowel and hot water by mouth.   Patient was given one ounce of whisky in hot water.   Her pulse picked up, but remained quite weak.

March 22nd: Hypodermoclysis of normal saline, 500 c.c.   Patient weak; pulse thready, but increasing in volume.   Bowel irrigated with hot normal saline solution.   External heat continued.   Marked improvement was shown by afternoon.

March 23rd: Patient much improved.   Enteroclysis and considerable water were given by mouth.   Patient was allowed to have stewed fruits and chicken.   Bowels moved.   Patient sleeps well.

March 25th: Patient much stronger; there is a slight diarrhœa. Her appetite and general condition are much improved.

March 26th: Patient is stronger and has a good appetite.   Stools are partly formed.   There is no fever.   The patient's general condition is much improved.

Operation No. 3 (March 28th—seven days after second operation).—Preoperative anti-shock intravenous infusion of normal saline, 250 c.c., with adrenalin 1 to 10,000.   Morphin-hyoscin narcosis.   Infiltration of parietal peritoneum with procaine, one-half of one per

cent. The enterostomized loop of small bowel was resected, and end-to-end anastomosis was performed, being accomplished by the two-layer suture method. No attempt was made to close the wound, but the gut was retained by a graduated gauze compress pursed in rubber dam. One piece of rubber dam was inserted into cavity of pelvis.

Post-operative Notes.—Patient was returned to ward with a very rapid, weak pulse and cold, clammy skin. She was given external heat and whisky, one ounce, and the foot of the bed was elevated. By evening she had slightly improved. At night she was very restless, but her pulse was better.

March 29th: Patient improved; is receiving liquids. She feels very weak, but her pulse is fuller. She is free from pain. At 5 P.M. she received 400 c.c. of normal saline solution with adrenalin, 10 minims, by hypodermoclysis.

March 30th: Superficial sutures removed from right rectus incision: three deep sutures left remaining. Wound in left flank dressed; it is fairly dry, practically odorless and granulating. Heart shows muscular sounds somewhat weak and reduplicated: ordered infusion of digitalis, one-half ounce three times a day after meals.

March 31st: Patient received 600 c.c. of normal saline solution by hypodermoclysis; pulse improved. Patient is hungry and desires food; bowels have not yet moved.

April 1st: Patient is receiving solid food—chicken and mashed potatoes. No bowel movement as yet, but she is passing gas. She complains of slight pain in right side of pelvis. Her pulse is gaining in strength. Later in the day her bowels moved—a normal, formed stool.

April 2nd: Moderate distention relieved by eserin, gr. 1/40 by hypo and by soapsuds enema. Patient's pulse is good.

April 6th: Temperature, $98^3/_5\,°$; pulse, 108. Bowels quite loose; orders—restrict fluids; phenyl salicylate, gr. X, bismuth subcarb. gr. XV every two hours, six doses. Tablets Bulgaricus, three tablets three times a day after meals. Lateral wound closing.

April 7th: Diarrhœa checked. Remaining through-and-through sutures removed.

April 13th: Patient continues to improve; she is gaining

strength rapidly; her pulse remains below 100, and she is laughing and joking with the other patients.

I fully and without any hesitation attribute this patient's survival to the selection and employment of local, instead of general anæsthesia. When first seen by me she was the victim of acute intestinal obstruction of one week's duration and manifested all the direful consequences of that condition. The extent to which her vitality had been lowered was shown by her extreme toxic shock with subnormal temperature, rapid thready pulse and clammy skin. She was, indeed, a poor operative risk, but nevertheless survived three intestinal operations within fifteen days. That such a happy outcome would have resulted had ether been employed is extremely doubtful. Those at the hospital who followed the case agreed with me that the use of ether would have killed the patient, if not at the first operation, then at the second or third, for she was naturally very weak when the two latter were performed. From experience with similar cases operated upon by both methods of anæsthesia, the author believes that *the way to lower the present very high mortality of late acute intestinal obstruction operations is to substitute local for general anæsthesia.* This opinion was expressed by the writer at the Atlantic City meeting of the American Medical Association in 1919, in opening the discussion on Dr. Farr's paper on " Local Anæsthesia." It is understood, of course, that the aim of the operation in either case is the removal of the highly toxic contents of the bowel at the earliest moment possible. That ether is a toxine and has a greater tendency to produce shock than to prevent it, no one will deny. That procaine is not a toxine and has a greater tendency to prevent shock than to produce it, everyone will affirm. In fact, the epoch-making anociation work of Crile is based upon the employment of a local anæsthetic, such as procaine.

As to the other interesting features presented by this case we shall first consider the operative indications. The indication at the first operation was to relieve the patient of the toxines responsible for her desperate plight. Therefore, a fistula was established in the small bowel at the lowest point above that obstructure that could be reached, and *nothing else was done.* The operation was not prolonged nor the patient's life jeopardized by trying to satisfy one's curiosity as to the cause of the obstruction. It was taken for granted that the cause

of the obstruction was adhesions following the hysterectomy several years previously, and it was thought that, with the fistula established, the immediate relief of the obstructing band had no bearing whatsoever upon the recovery of the patient from her state of acute toxæmia. In the convalescence from the first operation the free use of heat and fluids played a very important part, as the daily notes recorded in the history show. The second operation was performed eight days after the first. The interval between these two operations was made as short as possible, with a view to early closure of the fistula of the small bowel, which was a drain upon the patient's nutrition and strength. Before this fistula could be closed the obstruction had to be relieved or circumvented. When the abdomen was opened—this time through the right rectus—it was found that the intestines were firmly bound down deep in the pelvis by multiple dense, fibrous adhesions, release from which was deemed impracticable. Therefore, the obstruction was circumvented by performing ileo-cecostomy, taking the lowest loop of ileum above the obstruction. It was found that this loop of ileum could be approximated to the cecum without putting tension on the fistula area. Two days after this second operation the patient had the first stool by rectum since the onset of her illness. A week was now permitted to elapse before the third operation was performed, thus giving the patient an opportunity to regain strength and improve her general condition. At the third operation the enterostomized loop of small bowel was resected and end-to-end anastomosis was performed. The greatest difficulty encountered here was in separating the adhesions that had developed between the enterostomized loop and the parietal peritoneum; there was free bleeding from the granulations that had sprung up, and the field was very much obscured. The bleeding was soon controlled by hot compresses, and after resection of the congested bowel a clean fluid for anastomosis was at last obtained. The daily post-operative notes show the patient's gradual improvement up to the time of her discharge from hospital. She suffered for a time from diarrhœa incident to short-circuiting of a considerable length of the small bowel, but this was soon controlled by dietetic and medicinal means.

Attention is directed to the preoperative anti-shock intravenous infusion of normal saline solution with adrenalin; this was given as

soon as the patient was placed upon the operating table, and the purpose was to fortify the patient against shock due to the necessary operative manipulations, for it is better to prevent shock than to have to combat it. In addition to the intravenous medication, hot water bags were placed in the axillæ to keep the chest warm. Shock was further anticipated by morphin-hyoscin in fractional doses given previous to operation.

II. ACUTE UNILATERAL HÆMATOGENOUS INFECTION OF KIDNEY: NEPHRECTOMY AND DRAINAGE

Of interest to every practitioner is a condition that does not frequently arise, but that when borne in mind solves the riddle of an otherwise obscure case, namely, acute unilateral nephritis. The following is an excellent example of this disease.

Mrs. M. D., negress, aged forty-nine, was admitted to Douglass Hospital on May 21, 1919. She states that her illness began suddenly on April 2, 1919, with chilliness and pains in all joints, abdomen and chest, followed by fever. On May 20th—two days previous to admission to surgical ward—she developed generalized pain throughout the abdomen, with points of maximum intensity in right hypochondriac region and right kidney region.

Physical examination reveals in the right loin a noticeable bulging that is due to a tumor which is apparently solid and very tender; percussion determines the ascending colon in front of this tumor; there is no sign of superficial or deep cellulitis in the loin. Examination of urine reveals that it is acid, 1018, medium ring of albumen, no sugar; casts, epithelial cells and cylindroids present. Facilities for cystoscopic examination or catheterization of ureters not available. Blood: Hb., 45; reds, 2,800,000; whites, 14,360.

Operation (May 22, 1919).—Ether. Oblique incision made in right loin of the Israel type. There was no perinephric exudate. Kidney exposed and found enlarged. A spot of softening was palpated on the convex border of the kidney just below the middle; on cutting through the thinned cortex with the scalpel, white pus escaped, from which cultures and smears were made. Exploring with the finger, it was found that this abscess cavity led down to the lower pole of the kidney, involving the lower half of the organ. Drainage was inserted, consisting of a cigarette drain in the abscess cavity and a

strip of gauze between the kidney and Gerota's capsule. The deep portion of the wound was closed up to the drainage (which emerged through posterior angle of wound) with interrupted sutures of No. 1 plain catgut; while the superficial portion was closed with interrupted sutures of silkworm-gut. Dry, sterile gauze dressing.

Post-operative Note (May 26th—four days after operation).— Temperature, $98^3/_5°$; pulse, 90. Tenderness over right loin greatly diminished. Patient complains of no pain. Bacteriologic culture shows few streptococci and S. pyogenes aureus and albus.

This patient's history is suggestive of streptococcic infection, the portal of entry probably being the tonsils. Thus, seven weeks previous to admission to the surgical ward she was taken suddenly ill with chilliness and pains in all joints, abdomen and chest, followed by fever. That sounded like a streptococcic infection and when, seven weeks later, the patient developed generalized pain throughout the abdomen, with points of maximum intensity in right hypochondriac region and right kidney region, metastatic localization in the kidney —hæmatogenous in origin—was quite apparent. The cultural recovery of streptococci from the pus in the kidney determined the kind of bacteria responsible for the lesion. There were, in addition, staphylococci, but these were the secondary invaders that so often follow their streptococcic leaders.

As to the question of treatment, it is evident from the pathologic findings of an abscess in the lower half of the kidney that this must have been purely surgical. With the kidney exposed the decision had to be made between nephrectomy and nephrotomy with drainage. The abscess was apparently a single large one; the upper half of the kidney, aside from being hyperemic, was apparently healthy and quite free of abscess, single or multiple. And then there was uncertainty as to the condition or even presence of a kidney on the opposite side. It was therefore decided to drain, and if cure did not result to perform nephrectomy later. Fortunately, the symptoms did not recur, the wound healed uneventfully, and the patient got up and resumed her housework.

A case presenting the above picture must be differentiated from appendicitis, cholecystitis, hepatic abscess and perinephric abscess.

It would have been interesting to have had the tonsils removed and examined for streptococci, but the patient refused to submit to

such a procedure. Shortly before the above case was seen the writer had a somewhat similar instance of streptococcic infection in the person of a young girl who was suddenly taken ill with chills and high fever and fleeting pains jumping from joint to joint and from one serous membrane to another; thus, she developed diaphragmatic pleurisy and later pains about the appendix. After the acute attack had subsided there were left as sequelæ abdominal disturbances suggestive of appendiceal irritation—irritable stomach (pylorospasm), gas in stomach and in bowel, constipation and tenderness over Mc-Burney's point. There were also bilateral brachial plexus pains. After removal of the appendix with enucleation of the tonsils at the same sitting the patient's symptoms entirely disappeared. Unfortunately bacteriologic examinations of the ablated organs were not made, but the infection was clinically streptococcic in type.

III. OSTEOARTHRITIS OF HIP-JOINT (BILATERAL): RESECTION (L.) WITH TENOTOMY OF ADDUCTORS; INCISION AND DRAINAGE (R.)

This, together with Case IV, which came to the hospital a week later, furnishes an interesting clinic on acute infection of the hipjoint. One case followed diphtheria, the other scarlatina.

A. C., white, male, aged five years, was admitted to Polyclinic Hospital on April 23, 1919, being referred by Dr. Bernhard Segal.

History of Present Illness.—Patient was well until December 25, 1918, when he had an attack of diphtheria, which lasted eight weeks. Up to the time of this illness the patient had always been very active, playing with other boys and girls of his own age. While in the hospital he contracted many bed-sores. His mother did not know his hip was affected until after the child had been discharged from the hospital, and when she first saw him she found the right hip swollen and shiny. The child was taken home on March 1, 1919. After being home for three days he was taken to another hospital, where the attending surgeon first thought the child had rheumatism; there the skiagram revealed necrotic processes in both hips. Four or five weeks after patient was admitted to the hospital the surgeon commenced traction and extension on both thighs; he also incised the right thigh and obtained pus.

Physical examination reveals sinus on antero-internal portion of right thigh below Poupart's ligament. Thighs are flexed on abdomen

and legs on thighs; the left thigh is strongly adducted, giving the typical " scissors " deformity. The patient cannot completely extend legs on thighs. Slight external rotation of right leg. Swelling and redness over and around left great trochanter. Patient is unable to walk or sit upright. He has lost considerable weight and strength since December, 1918. He coughs somewhat and has coryza. His appetite is fair. He is emaciated and anæmic. His teeth are decayed, and the tonsillar crypts are enlarged. There is no diarrhœa.

Skiagram (Fig. 1) reveals necrosis of head of right femur with sequestra and also disintegration of left hip-joint, with luxation of head on dorsum of ilium.

Operation No. 1 (April 25, 1919).—Ether. Sprengel incision employed. Tenotomy of contracted adductor tendons on left side. On reflecting gluteal muscles downward first the displaced head of the femur was encountered, and, secondly, a collection of pus around the greater trochanter. The diseased femoral head was removed by sawing through the neck midway between the head and the base of the neck (trochanter). By hyperadducting the limb a passageway was obtained through which the finger was passed into the joint. A large quantity of gelatinous brie, which occupied the joint capsule space between the femoral neck and the inner portion of the capsule, was scooped out with the finger. The acetabular cavity floor felt bared of cartilage and rough, but not markedly necrotic. A counter-incision was made at the lowest point of the floor of the subgluteal abscess cavity; through this there were passed up into the cavity of the joint a fenestrated rubber tube of $\frac{1}{4}$-inch calibre, and alongside the tube a gauze drain saturated with dichloramin-T. A piece of gauze was placed in the cavity left remaining after evacuation of the abscess and brought out through postero-superior angle of wound. Incision partly closed, using interrupted sutures of No. 1 plain gut for muscles and gluteal fascia and interrupted silkworm-gut sutures for skin. Drainage tube sutured to edge of counter-puncture with a single suture of silkworm-gut. Dry, sterile gauze dressing applied. Buck's traction apparatus applied to both thighs and a separate set to both legs— 20 pounds traction on each limb. Limbs abducted in Rainey travois splint (Fig. 3).

Post-operative Note (April 29, 1919).—Directly after operation the fever rapidly disappeared; the pulse remains rapid—about 149.

The patient now sleeps the whole night through. To-day, temperature, 100°; pulse, 94. Discharge on dressing has not been profuse. Dressed to-day; all gauze packing removed; wound syringed with dichlora-min-T. Entire wound drains satisfactorily through lower opening. Iron and arsenic ordered for patient.

Operation No. 2 (May 21, 1919).—Ether. Anterior sinus in Scarpa's triangle, right side, opened and explored; it led to an old abscess pocket with indurated walls, which extended posteriorly to the vicinity of the lesser trochanter. This cavity was extended from the latter point with closed forceps above the upper edge of the adductor magnus and just below the obturator externus to the skin posteriorly, where a counter-puncture was made for drainage consisting of one fenestrated rubber tube and a piece of rubber dam. Dry gauze dressing.

Bacteriologic Report.—Culture from pus sterile.

Post-operative Notes (June 2, 1919).—Anterior sinus closed; posterior sinuses almost wholly closed, discharging merely a thin, watery fluid that gives rise to considerable itching. Patient sent up on roof, the traction now being removed by day and renewed by night.

Blood Count (May 31, 1919).—Hb., 50; reds, 4,400,000; whites, 17,500.

December 15, 1919: It is now eight months since the resection of the left hip-joint and seven months since drainage of the right hip-joint. The patient is well nourished, fat and has rosy cheeks and sparkling eyes. The left hip-joint has good motion in all directions, while the right hip-joint is ankylosed. The left lower limb is about three-fourths of an inch shorter than the right, but this shortness is compensated by a higher shoe on the left side. All sinuses are entirely closed. (Fig. 2.)

The discussion of this case will be included in that of the next.

IV. OSTEOARTHRITIS OF HIP-JOINT (R.), ACUTE INFECTIVE: INCISION AND DRAINAGE. TROCHANTERIC APOPHYSITIS (L.); INCISION AND DRAINAGE

M. P., white, male, aged twenty-seven months, was admitted to Polyclinic Hospital on April 30, 1919, having been referred by Dr. G. Victor Janvier, of Lansdowne.

History of Present Illness.—The patient has just recovered from

Fig. 1.

Case III. Preoperation skiagram of postdiphtheritic bilateral osteoarthritis of hip-joint. The left side shows the classic "scissors" deformity, in which the thigh is pulled over across the perineum from contraction of the adductors in the presence of pathologic luxation of the caput on the dorsum of the ilium, as obtains here. On the right side the joint is diseased, but there is no luxation.

Fig. 2.

Case III. Postoperation skiagram of postdiphtheritic bilateral osteoarthritis of hip-joint. On the left side the classic "scissors" deformity has been overcome by tenotomy of contracted adductors and reduction of the luxation after resection of the caput. On the right side a residual abscess was evacuated by incision and drainage.

FIG. 3.

Case III. Postoperation skiagram of postdiphtheritic bilateral osteoarthritis of hip-joint showing Buck's traction apparatus—one set tugging on legs to straighten out flexed knees, the other set tugging on thighs to straighten out flexed hips. The V-shaped Rainey travois splint maintaining bilateral adduction is also shown.

FIG. 4.

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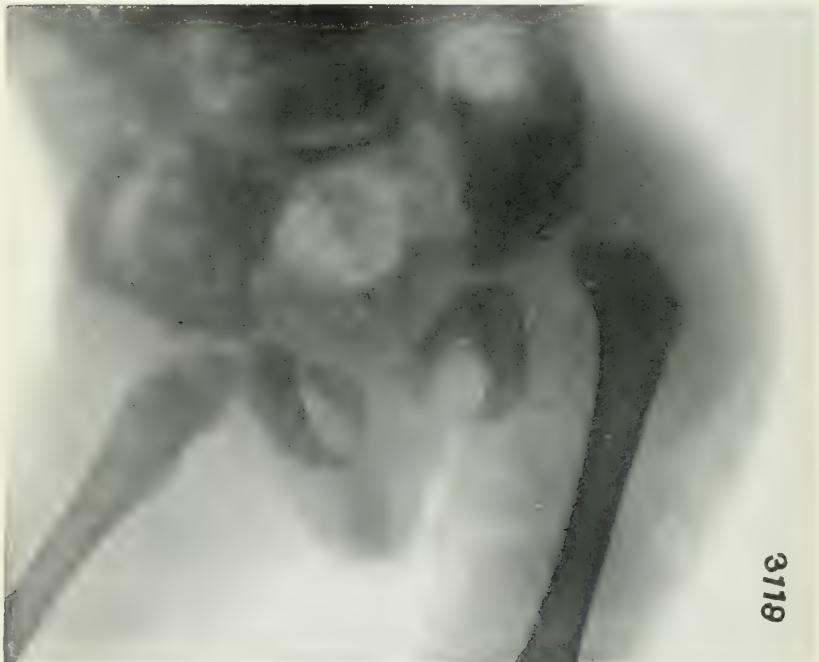
Case IV. Preoperation skiagram of postscarlatinal osteoarthritis of right hip-joint. Note dorsal luxation of caput. Comparison with Fig. 2 shows the importance of getting these cases early. The apophysitis on the left side has not developed yet.

Fig. 5.

Case V. Preoperation skiagram upon which the diagnosis of sarcoma of humerus was based. Note gnawing-out of cortex and also the comb-like extensions of ossification toward the surface. (Skiagram by Dr. J. E. Roberts, of Camden, N. J.)

FIG. 6.

Case V. Sketches made at operating table showing steps in operation of resection of humerus for sarcoma and transplantation of upper portion of fibula to humerus stump. Above and to the left one sees the enlarged lymph-nodes along the cephalic vein. The remaining portions of the figure are self-explanatory.

an attack of scarlatina. In the later stage of the attack it was discovered one day when the bedclothes were rolled down that the right hip-joint was swollen and deformed, and to this there was attributed the continuance of the fever. The patient also had otitis media on the right side.

Physical examination reveals over the right hip a fluctuating swelling, which is painful to pressure; there is no reddening of the skin over this swelling; the hip is luxated posteriorly. There is a thin discharge from the right ear.

Skiagram (Fig. 4) reveals posterior luxation of right hip with a small sequestrum overtopping head of femur; the skiagram does not, however, reveal any erosion of either of the bones that enter into the formation of the joint.

Operation (May 2, 1919).—Ether (only about 120 drops in three minutes necessary). External incision over right great trochanter three inches in length, opening into abscess cavity deep to fascia lata; thick, white creamy pus evacuated; culture taken. Head of femur felt in contact with dorsum of ilium; the head was eroded and felt rough, like a cut section of cancellous bone; acetabular cavity not palpably diseased. Head not resected, but replaced in acetabular cavity; from this time on the femur was held in the abducted position. A counter-incision was made at most dependent point of abscess cavity posteriorly; through this emerged two fenestrated rubber drainage tubes, of which one led from thyroid membrane downward to counter-opening, and the other from upper angle of the operative incision. The latter was closed by several interrupted silkworm-gut sutures, which apposed the skin and the superficial and deep fascias. Dry, sterile gauze dressing applied.

Post-operative Notes.—When patient was returned to bed Buck's traction apparatus was applied to the diseased right lower extremity; weight, 10 pounds.

May 6th (four days after operation).—The abscess cavity has been irrigated daily with dichloramin-T (5 per cent). Child much improved; temperature, 100°; pulse, 92; respiration, 30.

Bacteriologic Report on Pus.—Streptococci isolated.

June 2nd: Temperature, pulse and respiration suggest infection. Physical examination reveals fluctuating subcutaneous abscess in region of great trochanter of left femur.

Operation No. 2 (June 3, 1919).—Incision and drainage of abscess. Palpation revealed disease of apophysis for great trochanter.

N. B. (December 15, 1919).—Ultimate result is complete restoration of function of both hip-joints. Child has fattened considerably and is able to walk freely and without limping; no cane or other form of external support is required.

These two cases forcibly illustrate what is gained by taking time by the forelock and what is lost by ill-advised procrastination. The first patient's joints were wrecked by the long-standing infection, and it was with wrecked joints that the surgeon had to deal. So desperately ill was this child that the operation was primarily a life-saving procedure. The boy finally got out of his trouble with an ankylosed right hip-joint and a movable left hip-joint, and with both lower limbs straight. The mobility of the left hip-joint was due to the resection of the head of the femur, which was done in the first instance to afford better drainage of the badly disorganized joint. The right hip-joint was not resected, but was merely drained, for at that time the child's general condition did not warrant the more extensive operation of resection, the infective process in this hip had run its acute course and there remained merely a residual abscess, which cleared up uneventfully after drainage. Again, a child restored to health with ankylosis on one side only and a fairly wide range of motion on the other, although not an ideal result, yet was a fairly satisfactory one, considering that it had been so desperately ill. And mobilization of the ankylosed joint by arthroplasty could be performed upon a more auspicious occasion. Contrast with this the second child, who was operated upon relatively early, before the cartilaginous covering of the joint surfaces (especially that lining the acetabular cavity) had been destroyed. This child is now walking around without ankylosis. *The propaganda for early operation in acute appendicitis could well be applied to early operation in acute osteoarthritis and acute osteomyelitis.*

The Sprengel incision is the best one to employ for extensive hip-joint disease, especially when associated with displacement of the head of the femur on the dorsum of the ilium. The writer used this incision with satisfactory results in a case previously reported in these columns—a case in which the wing of the ilium was tre-

phined to reach and evacuate an abscess between its upper surface and the iliacus muscle. There is nothing that begets confidence in a surgeon so much as a well-exposed operative field, and in dealing with infected joints (this applies to infected bones, as well) completeness of cure is many times in direct proportion to thoroughness of exposure.

The Rainey travois splint (Fig. 3) is an excellent apparatus for maintaining abduction of both lower extremities. It is quickly and cheaply made by any carpenter. There is no use abducting one lower extremity only, for the opposite lower extremity will approximate the abducted one, thereby diminishing the angle of abduction. In the first case traction by Buck's apparatus was applied to both legs as well as both thighs, in order to overcome the partial flexion of the knee-joints, as well as to establish efficient traction of the hip-joints.

When pyogenic organisms attack the apophysis for the great trochanter of the femur, there is danger of death from pyemia. Fortunately, however, I was able to recognize and treat quite early this complication in my patient.

V. SARCOMA OF HUMERUS: RESECTION OF UPPER SHAFT WITH TRANSPLANTATION OF UPPER THIRD OF FIBULA TO HUMERUS STUMP

The following case is an excellent illustration of the possibilities opened up by the comparatively recent development of bone-graft surgery.

H. M., female, single, white, aged seventeen, referred by Dr. A. S. Ross, of Camden, New Jersey, was admitted to Medico-Chirurgical Hospital on January 12, 1920, with the following history.

On December 11, 1919, the patient was caught between the closing door of an ice-box and the jamb, the heavy door striking her left arm just below the shoulder. She exclaimed, " There goes my arm ! " as though it had been broken. She states that a " lump " appeared immediately afterward, that it slowly subsided, but has not entirely disappeared. There was no inflammation, nor was there any discoloration. A skiagram taken five days after the accident revealed a gnawed-out appearance of the cortex of the outer surface of the humerus, close to the surgical neck Fig. 5 ; while from the diseased cortex comb-like bony processes radiated to the periphery in a manner characteristic of bone sarcoma as seen by the X-ray. Physical

examination reveals beneath the left deltoid a bony swelling about the size and shape of a split olive (Frontispiece). There is no sign of inflammation. There is no interference with the motion of the shoulder-joint.

The excellent skiagram was made by Dr. Joseph E. Roberts, of Camden, who, with Dr. Ross, diagnosed sarcoma. Owing to the early age and small size of the neoplasm, as well as its position and absence of metastases, the case was considered a particularly favorable one for resection followed by bone transplantation. The choice of the source of material for transplantation lay between the tibia and the fibula. A tibial transplant, such as was used by the late Dr. John B. Murphy in a similar operation, presents the disadvantages of having to be shaped and, when shaped, of having no natural enlargement that would serve as an articular extremity. The upper portion of the fibula, on the other hand, already possesses a cartilage-coated and expanded articular head, which would serve as a good substitute for the head of the humerus. The shaft, too, is of suitable diameter to fit with very little shaping into the medullary cavity of the humerus stump and of sufficient strength to bear the stress of maintaining the proper length of the upper arm. And again, the fibula above the external malleolus may be removed without interfering with the supporting power and activity of the limb or with the movements of the foot in all directions.

The operation, then, was executed in accordance with the plan outlined above. The incision was the usual one for the anterior approach (Ollier's incision—Fig. 6). Exposure of the cephalic vein revealed along its course a lymph-node the size of a small lima bean (Fig. 6). This vein was therefore resected, together with the lymph-node, which was set aside for microscopic examination. The operation then proceeded along the classic lines for resection of the shoulder, the tendinous insertions of the muscles being divided in orderly manner from above downward. The capsule of the joint was preserved, but the periosteum was left adherent to the bone, to be removed with the latter. In this way the humerus was cleared to a point 3 cm. below the lower border of the neoplasm, at which distance from the latter the bone was divided with the Gigli wire saw and was removed from the field (Fig. 6). The bed of the resected portion of the

FIG. 7.

Case V. Sketch showing position in which upper extremity was dressed after resection of humerus and transplant of fibula.

FIG. 8.
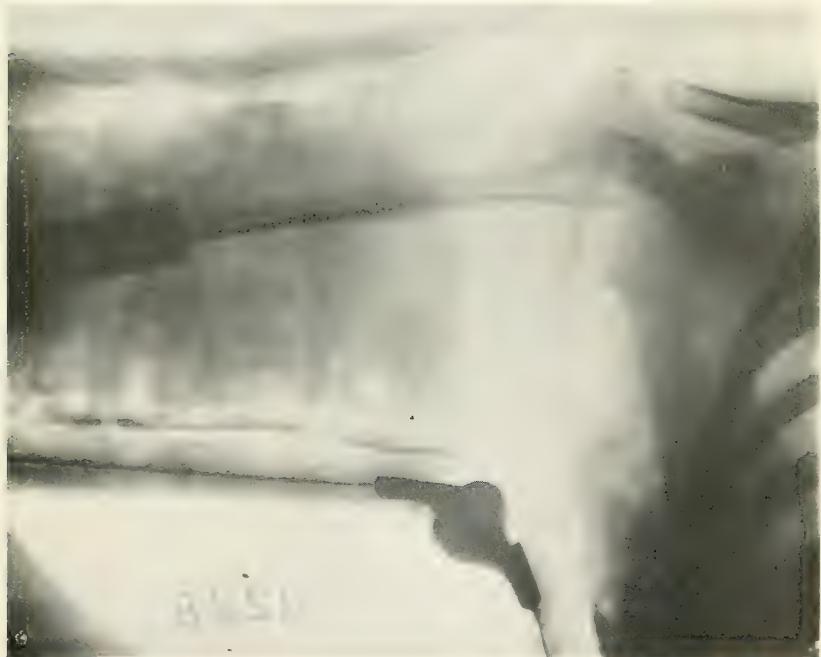
Case V. Postoperation skiagram showing transplanted fibula *in situ*. (Skiagram by Dr. J. E. Roberts, of Camden, N. J.)

FIG. 9.

Bed of resected portion of fibula. Note preservation of upper epiphysis and outline of periosteal tube. For these reasons regeneration of resected portion is looked for.

humerus was blood-free and dry; it was packed with dry, sterile gauze pads and temporarily closed with a few silkworm-gut sutures, pending the removal of the transplant. The upper third of the left fibula was now exposed by the usual posterior incision for resection of the upper half of this bone. The length of fibula to be removed was measured with the calipers, which had previously been opened to the length of the resected portion of the humerus and was removed by division with the Gigli saw and subperiosteal dissection from below up to the superior tibio-fibular joint. The peroneal nerve lay exposed in the field and was seen dividing into the musculo-cutaneous and anterior tibial. The fibular incision was now closed in such a manner as to obliterate dead spaces, due care being taken to avoid including in the sutures important nerves or blood-vessels. From the resected fibula material for a bonepeg was removed with the Albee motor apparatus (Fig. 6). A few strokes with Murphy's artist chisel whittled the lower end of the graft until it made a close fit in the medullary cavity of the humerus. The bonepeg was made with the Albee electric dowel. The graft was inserted three-eighths of an inch into the medullary cavity of the humerus stump in such a manner that its upper articular surface faced the glenoid cavity. The electric drill made a hole through humerus and graft into which a bonepeg was inserted to prevent the graft from slipping in or out of the medullary cavity (Fig. 6). The capsule was sutured accurately about the articular head of the transplant, and the tendon ends were coapted in their normal relationship with the skeleton of the upper arm. The soft parts were approximated by deep and superficial sutures of plain catgut. The upper extremity was immobilized in plaster-of-Paris with the upper arm at a right angle with the trunk, and the forearm at a right angle with the upper arm (Fig. 7).

Following the operation the wounds pursued an aseptic course. The patient was sent home on the fifth day. Examination at this time revealed undisturbed function of the muscles of the leg, foot, forearm and hand, with complete preservation of sensibility. These parts retained their normal color and size, there being no trace of swelling of the fingers. The plaster will be allowed to remain undisturbed for six weeks, during which time regeneration of the humerus is expected to proceed from the medulla and periosteum of the stump

along the fibular graft as a scaffold to the scapula. At the end of six weeks the patient will be encouraged to use the limb. Frequent X-ray studies of the progress of ossification will be made (Fig. 8). Owing to the patient's youth and the fact that the fibula was removed subperiosteally, complete regeneration of the fibula is anticipated.

(See article entitled "Excision *Versus* Amputation in Certain Cases of Sarcomata of Long Bones," by Byrne in "The Practitioner," February, 1917, p. 189.)

CLINIC BEFORE THE CLINICAL CONGRESS OF THE AMERICAN COLLEGE OF SURGEONS

AT THE NEW YORK HOSPITAL, OCTOBER 20, 1919

By DR. EUGENE H. POOL, DR. WILLIAM R. WILLIAMS (Chief of Medical Service), DR. FREDERICK W. BANCROFT, DR. SEWARD ERDMAN, and Assistants.

Case I

EXPLORATORY LAPAROTOMY FOR SUSPECTED CARCINOMA OF STOMACH
(DOCTOR POOL)

THIS patient with a tumor of the stomach is a woman, fifty-six years of age, admitted to the medical service two weeks ago, giving a history of nervousness, weakness, and recent diarrhœa. On further questioning it was found that she had been subject for many years to attacks of diarrhœa lasting a few days. These attacks recurred at long intervals. The remainder of her previous history has no bearing upon the case. Except for influenza, she has never had any illness. The history of her present illness shows that four weeks before her admission to the hospital her diarrhœa recurred and she had four or five watery stools accompanied by pain in the epigastric region. She had no vomiting and there was no blood in the stools. This condition continued for about a week, during which there was no nausea, no vomiting, no jaundice. There was occasional dyspnœa and some palpitation. There was a moderate loss of weight. The patient slept well and was fairly well nourished, though evidently quite nervous.

Physical examination did not give much information. The lungs seemed to be normal. The heart showed very little enlargement; the rate as well as the sounds were fairly normal. The abdomen was slightly distended and there was slight tenderness in the epigastrium. The reflexes were normal. That she had diarrhœa might be due to some chance cause and it might be that owing to this she was a little weak and in this condition the nervousness asserted itself and was responsible for the patient's condition to a large extent. It was decided, however, to look her over very carefully.

The first thing found was in connection with the gastric analysis,

which was done by the use of the Reyfuss tube and fractional extraction. The fasting contents of the stomach consisted in 45 c.c. of clear liquid containing no blood and no food particles. The patient was then given the Ewald meal and fractional extraction of the stomach contents made every fifteen minutes. Ten extractions were made at intervals of fifteen minutes. These showed a total acidity of 50 to 60 per cent. There was no free hydrochloric acid at any time. At the end of fifteen minutes the acidity was 15; it then went up to 20 and later came down to 10; then it went to 17 and again came down to 10 and remained there for a time and then came down to 7. These were the first striking findings in the case.

A blood count was then made and it was found that there was a slight secondary anæmia. The red blood corpuscles numbered 5,200,000 and the hæmoglobin about 80 per cent. The temperature chart showed that the temperature ranged between 99° and 100.5° F. per rectum. The urine analysis was made a number of times, and on one occasion albumen and a few casts were found. The phthalein output, however, was found to be satisfactory. The Wassermann test was made twice and found to be negative. A radiographic examination of the stomach was made following the ingestion of a barium meal, with the patient in the horizontal position. This showed in the region of the antrum a distinct defect in filling. An X-ray examination at the end of twenty-four hours showed nothing abnormal and nothing particularly abnormal in the colon. The patient was also fluoroscoped and under the fluoroscope this filling defect was found to be constant. The pylorus could be moved a little and there was no sensitiveness on pressure. At this time one could feel a tumor which seemed to be over the liver. At times this region seemed to be a little sensitive and at other times it was not sensitive at all. When the bowels were cleared out this tumor became very distinct. It felt like an inequality in the surface of the left lobe of the liver. It seemed that it must have been this mass which caused the filling defect which showed in the X-ray. The diagnosis was a tumor in the epigastric region which interfered with the filling of the antrum of the pylorus, accompanied by symptoms, which were not very striking, of nervousness, vomiting and recurrent attacks of diarrhœa.

In looking over that history one felt that diagnosis was not as easy a matter as it seemed. With an X-ray like this one, a secondary anæmia

and loss of weight, the diagnosis sounded easy, but the roughness of the liver had not been explained, and the patient had a negative Wassermann, and no occult blood in the stools or in the gastric contents. An exploratory laparotomy was indicated.

All things considered, before the operation, the diagnosis of carcinoma of the stomach was made. Making the incision in the usual way, we find a large neoplasm about three inches in length corresponding to the anterior surface of the stomach. It is hard and nodular and extends over the lesser curvature. The liver does not present any palpable nodes, though there are some nodes in the gastro-hepatic omentum. The lesion is more extensive than was indicated by the symptoms, the physical examination, or the X-ray. There seems to be no opportunity of doing a resection as we had hoped. There are no metastases in the liver or pelvis. In a case of this kind a gastro-enterostomy is indicated, and that is all we can do to relieve the patient. A gastro-enterostomy in this case is going to be difficult because it is almost impossible to bring much of the stomach up, and it is with difficulty that I can get enough of the posterior wall of the stomach for a gastro-enterostomy.

We will use chromic catgut for the first continuous suture through the peritoneum and the muscular layers in approximating the jejunum to the anterior wall of the stomach. With a wet towel we wall off the operative area because we are going to open both the stomach and the jejunum. Now having opened both these viscera, we will aspirate any accumulation of fluid. By doing this quickly we do not have contamination of the field. Having done this we enlarge our incisions. The stomach is tightly bound down and the tumor is very large. The redundant stomach mucous membrane we excise and if there is any redundant membrane on the jejunum we will excise that. We make the opening in the intestine a trifle smaller than in the stomach. It is important to get the angles correctly approximated.

Question: Do you use silk or linen?

Dr. Pool: I am using chromic gut throughout and think it makes a perfectly safe anastomosis, without any danger of causing irritation and less likelihood of ulcer development. Linen or silk remains an indefinite time. We next suture through all the layers to approximate the edges of the openings. The posterior layers are overhanded and the anterior inverted by using the Connell stitch. This is difficult

because we have not much of the posterior wall of the stomach upon
which to work. We invert the edge to get peritoneum approximated
to peritoneum. In doing this Connell stitch we do it first with one
hand and then with the other hand. The edges are folded in perfectly
right up to the angle. We have just had the clamps released and
there has been no bleeding. At this stage of the operation, the instru-
ment table with the instruments that have been used during the open-
ing of the intestines is removed and a clean table and instruments
brought before we begin to sew up the outer layers of the peritoneum
and the abdominal wall. We will now approximate the peritoneal
surfaces anteriorly with our original stitch. We now have an anasto-
mosis admitting easily two fingers in the collapsed position at the
lower part of the stomach reaching right up to the greater curvature
connected by a loop anastomosis with the jejunum. We now fix the
opening of the transverse mesocolon to the stomach. We go as far
behind as we can and close the transverse mesocolon entirely.

Question: What size chromic catgut do you use?

We use zero but it is very strong. It does not make a great deal of
difference about the size provided you get something that is strong.
This zero catgut is very strong and will stand anything respiration
and peristalsis will do. In closing the abdominal wall one must be
careful not to cut the ends of the sutures too short. They must be
long enough so they will not come untied when the continuous suture
is pulled on. We take a little muscle with each suture. On the sheath
of the rectus I use interrupted sutures, because that is a tissue that
needs mechanical support. For this I use chromic catgut No. 1
because we need something that is non-permanent. It takes two or
three minutes longer to put in the interrupted sutures, but it is worth
while, because if one stitch is severed the whole row of sutures does not
give way. When we suture the skin we put rubber tubes beneath the
silkworm stitches to keep the stitch from cutting into the skin. In the
upper abdomen in a case like this the vitality of the parts is diminished
and union does not take place easily, so we will leave these sutures in
about eleven days and thus hold them together mechanically up to that
time. We have tried to use catgut in the skin but find that there is
more infection with catgut than with silk. The only disadvantage of
the silk is that we have to take it out.

(This patient had an uneventful convalescence.)

CASE II

TUBERCULOSIS OF THE EPIDIDYMIS: OPERATION (DR. SEWARD ERDMAN)

The next case is a minor operation but it presents an opportunity to discuss the treatment of tuberculosis of the epididymis. There is at the present time a tendency towards radical treatment of this condition. I find in the recent literature that many surgeons think the testicle should be removed in the presence of tuberculosis. The removal of the testicle is a radical procedure and the question arises as to whether it is a justifiable procedure. The tuberculous process may be so extensive that the whole testicle must be removed. This patient, however, is an early case, and it is in such cases that the question arises, " Shall we simply excise the epididymis or shall we also remove the testicle? " French authors have found that in over 66 per cent. of autopsies the testicle as well as the epididymis is involved. This is probably true in the advanced cases. If the testicle is removed for tuberculosis of the epididymis on one side we know that the disease will not infrequently recur on the other side, and this furnishes one of the best arguments against castration. In early cases, why should the testicle be removed if it is not involved in the tuberculous process? It is because many poor results have followed epididymectomy. There are likely to be unsatisfactory results in cases in which the testes are involved as well as the epididymis, because in removing the epididymis one removes only a part of the infection. One should be guided then by the degree and extent of the process in determining whether to remove both the testicle and the epididymis or only the epididymis.

In this case external examination shows no involvement of the testis, but only of the epididymis and especially of the globus major. We will, however, make a small incision into the posterior border of the testicle and investigate, just as we might incise the kidney before doing a nephrectomy. The removal of the epididymis will not interfere with the internal secretion and this is another reason for preferring it to castration. This patient has had the condition for some time, at least three months; he has lost weight but has had no night-sweats. His Wassermann reaction is negative. He had gonorrhœa seven years ago and urethritis. He has had no recent exacerbation of the urethritis. As there is some involvement of the globus major, we

have made a rather high scrotal incision which gives us plenty of room for demonstration, and for following up the vas as far as we may desire. The effort should be made to preserve the blood supply to the testicle itself. We will open the cord structures and then we should be able to deliver the testicle. In a condition of this kind it is not unusual to find a slight amount of hydrocele fluid in the tunica.

Is tuberculosis more common at the upper pole or at the lower pole? On this question there are different opinions. Some find it more commonly in the globus major of the epididymis and others find it more commonly in the globus minor, while gonorrhœal infection is more common in the globus major. In this case there is a very small amount of hydrocele fluid. The tunica vaginalis is hemorrhagic and thickened which leads me to think that we may find the testicle involved. There is a yellowish, cheesy collection in the globus major. We have now started to remove the epididymis, beginning below. There are some adhesions of the tunica vaginalis requiring dissection. In this case it will be wise to examine the testis by an exploratory incision. The globus minor is now coming off. The artery of the vas enters the testicle at the upper angle, near the margin, on the outer side, at a point where we are not likely to damage it. Now we come to the diseased upper pole. The most conservative surgeons are inclined to curette the diseased area and then to rely upon the open air and general hygienic treatment and not even to do an epididymectomy. We have now freed the globus major. The little ducts from the testicle must be divided and then we follow up the dissection without injuring the blood supply and complete the removal of the upper pole. The testicle must be kept warm and moist during the operation. We are now removing the greater part of the tunica. Following the vas further up we can study it more easily and we will remove it as high as there seems any occasion for doing so. The vas does not appear diseased. We will ligate the vas high up and remove this mass. With a clean scalpel we will incise the testis and see if we have removed all the tuberculosis. Examination seems to show that we have a normal testicle. We will now suture the incision in the testis which we made in order to make this inspection. The removal of the testicle in early tuberculosis where it is not involved would seem to be absolutely contra-indicated, because it is possible to remove the disease without removing the testicle. We have now sutured the tunica

albuginea and testicular tissue and we may leave it without detriment to the internal secretion. Apparently we have left the blood supply intact and we have removed the entire epididymis. We have also seen that there is no torsion of the cord in laying it back. There is a tendency to oozing so we will introduce a small rubber drain which we do not always use. We will then close the wound in layers, suturing the subcutaneous tissues with chromic gut and the skin with silk.

Case III

FRACTURE OF THE TIBIA AND FIBULA (DR. FREDERIC W. BANCROFT)

This is a case in which we may apply what war surgery has taught us. This man was run over by an automobile and sustained a compound fracture of the lower end of the tibia with a simple fracture of the fibula. He came into the hospital three hours after receiving the injury. The lower end of the tibia projected out through the skin. If it had not been for the war probably most of us would have incised the wound and left drains in. I made an oval incision excising the skin about the projecting portion of the tibia. Then by sharp dissection removed all traumatized fat, fascia, muscle; keeping as far as possible outside of the tract. I removed the loose fragments from medullary canal and morticed the ends of the bone. There was no foreign body in the wound and it was closed without drainage. This is the twelfth day following the operation. The patient ran a slight elevation of temperature, about 101° F., on the first day. You can now see the healthy appearance of the wound. It has healed by primary union. This is not a perfect anatomical result, but the patient will have a good weight-bearing limb. This procedure cannot be carried out in all cases, but time and experience will undoubtedly standardize it.

During the war this procedure was adopted at Depage's clinic in Belgium, for the treatment of compound fractures of civil life. Their results were so good that Doctor Pool thought it advisable to try it in similar cases in the New York Hospital. Four cases have been treated in this manner on the Second Surgical Division, and we have obtained primary union in all cases. One case developed a small superficial abscess on about the twenty-sixth day, which healed within three days after incision.

Medicine

THE GASTRIC CRISES OF CEREBROSPINAL SYPHILIS *

A STUDY WITH A DETAILED REPORT OF THREE CASES

By B. B. VINCENT LYON, A.B., M.D.

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SPINAL or cerebrospinal syphilis is comparatively common. The finding of the treponema pallidum in the meninges or in the nerve tissues of the spinal cord or brain, in many cases hitherto classified as non-syphilitic or para-syphilitic, has widened the degree of incidence. Infection of the nervous system in most cases takes place during the *late primary and early secondary period,*[1] that period which marks the transition from a sharply localized infection, represented by the primary sore, to a widely disseminated constitutional disease, which, by reason of the direct transportation of the treponema pallidum *via* blood- and lymph-vessels, may potentially attack any organ, structure or tissue of the body which is bathed or nourished by such fluids.

Why is it then that every case of syphilis does not involve the nervous system? In a disease of such protean possibilities and such varied manifestations, if we admit the casual factor to be in all cases the treponema pallidum, we cannot correlate the various types of this disease unless we assume the presence of different strains in this family group. Thus different strains, modified by biological characteristics, such as varied degrees of virulency, may possess certain selective affinities for various organs or tissues, which may be altered by biochemical characteristics governing tissue resistance or tissue immunity to these strains.

Surely it is not merely a coincidence that we note the very striking infrequency of locomotor ataxia (tabes dorsalis) in the negro,[1, 2, 3]

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* Read before the Section of the Practice of Medicine, at the meeting of the American Medical Association in New York City, in June, 1917.

especially the pure blooded African negro, and likewise in the Chinese,† both races which have for generations been saturated with syphilis. Does not this indicate a possibility of racial immunity against certain strains of the treponema pallidum, which have a selective affinity for the tissue of the nervous system? Or may it be explained on the ground that in these races the central and spinal nervous systems are not as highly organized or sensitized as in other races, perhaps due to environmental causes, and thus offer a less suitable pabulum for spirochætal colonization. This premise might be taken in substantiation of Noguchi's inability to experimentally produce the lesions and clinical symptoms of cerebrospinal syphilis until he had sensitized his experimental animals to the treponema pallidum by intravenous injections of spirochætes.

It is a clinical commonplace to note in cases of tabes dorsalis the frequency [8, 9, 10] with which mention is made of the inconspicuousness of the primary sore, and the absence or mildness of the secondary symptoms and lesions. This might mean either an infection with a strain of treponema pallidum having an affinity only for the nervous system and an inability to colonize in other viscera or body tissues, or it might mean that the very mildness of the primary and secondary lesions may have caused the individual, so infected, to have little recognition of the seriousness of his disease, so that its treatment is relatively or absolutely neglected until the onset of the cerebral-spinal symptoms.

Among the most interesting and important of these early symptoms are the visceral crises, which generally make their appearance in the pre-ataxic stage. These visceral crises are laryngeal, bronchial, cardiac, gastric, intestinal, renal, rectal, and genital. It is the especial purpose of this paper to as briefly as possible present a study of the gastric crises of cerebrospinal syphilis with such combinations of other associated visceral crises which in general bear upon the primary subject.

What are the gastric crises of syphilis? To answer this question we must first of all demonstrate beyond peradventure the diagnosis of syphilis either of the cerebrospinal system alone, or syphilis affect-

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† Yet Cheyney reports three cases of gastric crises occurring in Japanese—all in the pre-ataxic stage, but showing various stigmata of tabes.

ing other viscera or tissues of the body. In some cases this is absurdly easy, but in many cases one of the most difficult of medical problems, which may most severely tax the keenest detective of disease. Especially is this true in those cases in which the gastric crises occur as the initial symptom of a cerebrospinal syphilis, and in which the historical evidence of syphilitic infection is obscure and the blood Wassermann is returned repeatedly negative. But having established the diagnosis of syphilis and returning to the question, gastric crises, so called, are generally described as sudden seizures of upper abdominal pain preceded, accompanied or followed by vomiting and associated with various disturbances of secretion. These attacks usually occur with extraordinary suddenness, may strike down the individual while in seeming good health, apparently with no premonitory symptoms; may last for one week or several days, rarely for two weeks or more, and may cease as spontaneously as they occurred, with a sudden restoration to the patient's normal state of health out of all proportion to the severity of the attack.

Several men, Graves [11] in 1842, Romberg [12] in 1851, and Grube [13] in 1859, reported cases exhibiting this symptom complex, but failed to note the connection between these gastric symptoms and disease of the spinal nervous system. This connecting link was first supplied by Delamarre [14] in 1866. While these reports thus antedated by several years Charcot's [15] publication of 1868 and the years following, nevertheless to Charcot is given by universal consent the credit for his presentation of the gastric symptoms occurring in tabes dorsalis, symptoms for which he coined the term of " crisis gastriques." His masterly grouping of symptoms and pathology is all the more remarkable when we remember that nearly half a century elapsed before the discovery of the specific causative agent for this disease, a discovery that has opened up the way to a better understanding of the pathology and disturbed physiology of cerebrospinal syphilis.

In 1882 v. Leyden [16] described cases exhibiting gastric symptoms similar to the gastric crises of tabes dorsalis, but in whom there were no other symptoms of tabes. He considered these symptoms due to a nervous origin but attributed them to a neuralgia of the pneumogastric nerve or of the cœliac plexus. These may have been, indeed, true gastric crises of a syphilis involving the medullary nucleus of the tenth cranial nerve, or a syphilis of the posterior nerve roots of the

mid-dorsal segments, in cases in which the gastric crises represented the initial symptom of tabes. His publications concerning periodical vomiting were soon followed by other writers,[17, 18, 19] whose published cases largely confirmed v. Leyden's observations. So great was the interest aroused in Charcot's description of gastric crises that the literature is replete [20, 21, 22, 23] with published reports of visceral colics with nausea, vomiting, hemorrhages, diarrhœa, etc., but associated with various purpuric skin lesions or œdemas which would place them among the group of visceral crises occurring in angioneurotic œdemas, and the erythemas so well classified by Osler.[24]

So diverse have been the symptoms associated with gastric crises that Sainton and Trenc [25] have described in great detail six different varieties of gastric crises and Fournier,[26] Charcot [27] and Cade and Leriche [28] have also attempted to classify different types of these crises. It is not within the scope of this paper, nor is it the intention of the writer to enter at length into such a discussion. Suffice it to say that there may be attacks exhibiting a great variety of symptoms varying both as to duration, frequency and severity.

There may be mild attacks featured only by vomiting, with absence of pain and absence of secretory disturbances. There may be attacks of great severity with agonizing pain and persistent vomiting, first of gastric contents, later duodenal contents and still later jejunal contents.

In the writer's opinion what the character of the vomitus may be depends to large extent upon the writer's theory of double point spasm, which will be elaborated later. If, for instance, the lower point of spasm is at the pylorus the vomitus will be entirely gastric, sometimes merely continuous dry retching and sometimes of a hypersecretory type, depending upon the integrity of the gastric mucosa and its response to vagal stimulation; should the pylorospasm relax there may be momentary expulsion of bile from the duodenum, but only in small amounts, and as a rule not persistent. If the lower point of spasm should occur in the duodenum below the entrance of the common duct, the type of vomiting will be persistently associated with biliary regurgitation, frequently in excessive amounts and often continuing for many hours. If the lower point of spasm should occur lower down in the jejunum, the vomitus is first gastric, then biliary and still later mixed with contents from the jejunum.

In all of these varieties, if the double point spasm is maintained for long, the resultant increase in intrasegmental pressure will result in gastric dilatation alone, or dilatation of both stomach and jejunum, as seen in Case I. When such dilatation occurs there eventuates marked prostration that may be most alarming and at times may be accompanied by gastric tetany, which unless promptly relieved usually results fatally. Such a case associated with duodenal ulcer has recently been reported by Bine,[29] which resulted fatally.

Somewhat rarely the vomitus may be accompanied by hæmatemesis, as in cases reported by Vulpian,[30] Simoni,[31] Charcot,[32] Ranzier and Rogers,[33] and Cheney.[34] In one of the writer's cases hæmatemesis occurred several times, beginning first as a result of continuous difficult retching, which probably served to traumatize a friable and congested mucous membrane, causing minute erosions which, aggravated during the course of subsequent attacks, has finally resulted in prepyloric ulceration as determined by X-ray and laboratory examinations (cf. Case I). It is quite possible, therefore, that some of the reported cases of hæmatemesis have been due to gastric ulcers established before the onset of attacks or produced by the attacks.

The frequency with which attacks of gastric crises occur in individual cases varies within wide limits; they may occur in a mild form every day for several successive days and disappear for several weeks, or one severe attack may last for a week or more and some [35] have been noted with a continuous duration of three or four weeks. Even in an individual case there is no uniformity as to the mildness or severity of the crises, nor any regularity in the time or duration of their appearance. In some cases there may be seen associated visceral crises either occurring independently or accompanying the gastric crises. This was noted in Case I, who began first to exhibit laryngeal crises, later cardiac, and still later gastric and intestinal, and indeed, in one or two attacks closely observed these different visceral crises could be differentiated as making up part of the whole.

Where the laryngeal and cardiac crises occur there must be spirochætal involvement of the vagus, either at its medullary nucleus or somewhere along its course. Indeed, some of the gastric crises may be of a mixed type themselves, due in part to vagal syphilis, which better accounts for some of the secretory and spastic conditions, and due in part to involvement of the posterior roots of the dorsal spinal

segments, which carry the chief sensory fibres to the stomach and furnish the commonest cause of the pain of the gastric crises.

The average duration of any single attack may lie somewhere between five and seven days, although some may last only a few hours. *The greatest characteristic of any attack, no matter of what variety, is the startling suddenness with which it is ushered in and the equally abrupt termination of the attack.* Even after a severe and protracted crisis of a week or longer, when it is over the patient becomes immediately hungry, wishes to eat, and unless his case be complicated by organic gastric disease, such as ulcer, etc., the stomach ceases to be irritable and does not occasion any digestive disturbances.

During a severe attack, where pain is conspicuous, it may be agonizing and cause the patient to assume all sort of bizarre positions to gain relief. While an attack is in progress the abdomen is usually retracted, except in those cases complicated by gastric or duodenal dilatation, is often extremely tender to palpation, especially in the epigastrium, the muscles are often held rigid, and if difficult vomiting has been persistent the thoracic and the abdominal muscles maintain a soreness which may last for several days after the attack has subsided.

In the severe attacks the amount of prostration may be very great, partly due to continual retching in the vomiting types, with acute gastric dilatation, and partly due to a cardiovascular failure, which may imminently threaten a fatal collapse. Such were the conditions seen in Case I, who frequently was considered beyond all hope of recovery; his systolic blood-pressure being reduced to 70; his pulse-rate 150 or more; with periods of intense cyanosis and air hunger. Yet his myocardium, although severely taxed, possessed sufficient integrity to respond to urgent and repeated stimulation. Probably some cases of this type are due to direct spirochætal colonization in the heart muscle.

Prodromal symptoms have been rarely noted, and this fact is emphasized throughout the literature. Lockwood [36] states that they are practically unknown. Vulpian [37] reported a case where an eruption on the thigh appeared to usher in each crisis.

In two of the writer's cases definite prodromal symptoms were detected. In both Case I and Case II a premonitory sense of depression, a change in disposition, with a visible restlessness were noted for a day or two before the attacks. This may possibly be explained

as the beginning toxic effect of the ethylamines in the Beta position found in the intestinal tract before the explosive summation of the crises.[38]

Again, in Case I for several days before the attack there was noted a striking increase in the amount of bile-stained fluid vomited each morning on the fasting stomach. If this fluid could be gotten rid of by vomiting the symptoms might be aborted; if emesis could not be secured, even by induced retching, the sensation of double retrosternal and epigastric lump (to be described) would begin and in a few hours an attack would be under way. This observation led me to empty this patient's fasting stomach each morning by duodenal tube, until he had learned to do so himself. This measure, he would tell you, has brought him the greatest amount of relief, and has permitted six months to elapse since his last attack. These daily extractions of fluid were analyzed and a glance at the charts for March and April (cf. Charts I, II, III and IV) will show the marked irregularity in the amounts recovered, in the acidities, and in the varying tendency to duodenal regurgitation. The constancy of the occult blood findings speaks clearly in support of complicating gastric ulcer and would seem to contra-indicate such frequent passing of a metal-tipped foreign body were it not for the fact that this measure has prevented any further crises, and the irritation of the ulcer, therefore, seems the lesser of the two evils.

Pain, vomiting and various disturbances of gastric secretion make up the usual triad of this condition. Yet, I would like to dwell for a moment on other symptoms which have impressed me as being of great importance. There is not uncommonly a complaint of lower thoracic and upper abdominal fulness and pressure seen early in some attacks, which may progress to an unbearable sense of a ball-like lump felt behind the lower third of the sternum, a sense of a " fixed lump " that seems impossible either to get up or to get down, and a sense of a second lump, referred to the right, mid- or left epigastrium along a line just above or at the level of the navel.

This sense of lumps may suddenly disappear, and the epigastric pressure-fulness may be relieved, often only temporarily, by explosive belching of gas, or by the passing of gas from the stomach to intestines, or by expulsion of gas from the rectum. This type of crisis may be similar to that, described by Fournier,[39] of the flatulent variety of

Case No I Mr. W.M.S. Age 32

Chart No I.

Cerebro-Spinal Syphilis

Daily Extractions of fasting morning
Gastric Residuum

Color Key.
1 = grey brown
2 = peacock green blue
3 = bile green
4 = pale grey
5 = grey blue (slate)

Note: The tendency to fasting hypersecretion
The frequency of fasting hyperacidity
The " " " biliary regurgitation
The constancy of bleeding due to erosions or congestion.

acidity %
90

75
60
45
30
15

March.1917	1	2	3	4	5	7	9	10	11	12	14	15	16	17	19	21
Free HCl	50	30	50	10	10	50	50	15	10	35	20	65	40	30	0	35
Total Acid	70	50	70	45	25	70	65	40	25	50	30	85	60	75	25	60
Occult Blood	+	+	+	+	+	+	+	+	+	+	+	±	+	++	±	+
Color	1	2	3	2	4	4	2	4	4	2	4	3	2	4	4	5
Amt in cc	100	90	90	60	60	40	40	20	15	50	8	45	65	4	20	50

Case No I Mr. W.M.S. Age 32

Chart No. II

Cerebro Spinal Syphilis

Daily Extractions of fasting morning
Gastric Residuum

Color Key
1 = grey brown
2 = peacock green blue
3 = bile green
4 = pale grey
5 = grey olive (slate)
6 = yellow
7 = Turbid olive green.

Note: The lessening hypersecretion (due to treatment?)
The lower acidity.

acidity %
75

60
45
30
15

March 1917	23	25	27	29	31	April 1	3	5	7	9	11	13	15	17	19	21
Free HCl	5	22	40	0	0	10	20	5	30	25	40	25	35	20	40	40
Total Acid	20	40	60	15	20	30	40	20	45	40	55	45	50	35	65	65
Occult Blood	+	+	+	0	++	+	++	0	+	+	++	±	+	±	0	±
Color	4	2	3	4	4	6	6	4	4	4	4	4	7	4	4	4
Amt in cc	10	60	50	5	25	40	30	20	45	30	50	7	20	25	50	25

Case Nº I   Mr. W.M.S.   Age 32.

Chart No. III   Cerebro-Spinal Syphilis.

Daily Extractions of fasting morning
gastric Residuum

No. of cc.   Color Key.
105   1 = grey brown
           2 = peacock-green blue   Note: The lessening hypersecretion. Due to Treatment
90   3 = Nile green.   The lower acidity curve.   "   "   "
           4 = pale grey   The relative absence of   "   "   "
75   5 = grey blue (Slate)   biliary regurgitation }
Acidity %   The constancy of bleeding
60   in all charts.

45

30

15

April 19,7	23	25	27	May. 3	4	5	6	7	8	9	10
Free HCl	10	10	10	35	5	40	20	15	25	10	10
Total Acid	20	25	25	50	25	50	35	35	45	30	30
Occult Blood.	0	++	+	+	+	++	++	++	++	++	++
Color.	4	4	3	4	4	5	5	5	4	4	2
Amt in cc.	15	40	80	60	30	40	50	30	15	45	30

Chart No. IV   Case #I   Mr. W.M.S.   March 28. 19.7

12 hour fasting Residuum   Cerebro-Spinal Syphilis.
after motor meal.   Chart made between attacks.
50 cc bile stained mucoid   Chart shows practically normal
flocculer. plus. Oc. Blood +   Secretory curve with a moderate
Free HCl. 40 Total acid 60   Catarrhal gastritis and Congestion.
No food rests.   moderate motor delay.

Secretory test meal
Bread 50 gms
Acidity %   water 350 cc.
90

75

60

45

30

15   Total acidity

Hours.	¼	½	¾	I	1¼	1½	1¾	II	2¼	2¾	III	Free HCl.
Free HCl	20	30	40	50	55	60	50	50	40	15	0	
Total acid	30	45	60	70	70	80	65	65	50	30	15	
Occult Blood.	0	0	0	+	+	+	0	0	0	+	+	
mucus	0	0	0	±	±	+	+	±	±	+	+	
Bile	0	0	0	0	0	0	0	0	0	±	0	
Chyme	±	+	+	+	+	+	±	±	±	±	0	
Amt. in cc.	15	15	15	15	10	15	10	15	10	20	20 = 160 cc ∴ 190 cc passed.	
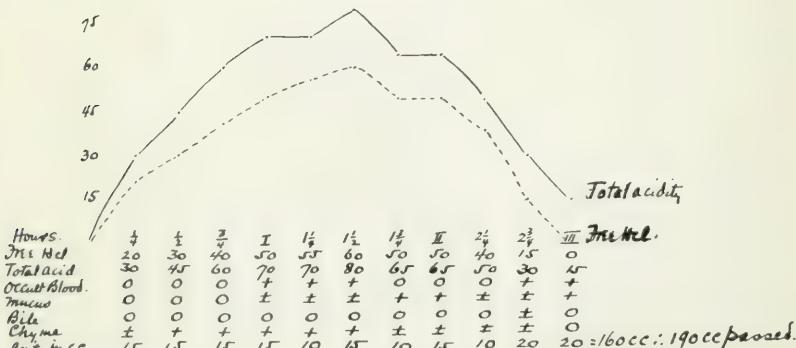
Chart No. V   Case # II   Mrs. A.E.Z.   Dec. 27th 1916.

10 hours fasting stomach
after motor meal.
Empty except for bile stained
mucus. Free Hcl. trace.
Total acid 5. Occult blood +.

Spinal Syphilis -
Chart made when patient was
in relatively good health 76 days
before an acute gastric crisis.
Chart shows: Delayed digestion.
Catarrhal gastritis. Congestion
Biliary regurgitation.

Secretory test meal
Bread 50 gms.
Water 350 cc.

Acidity %.
75
60
45
30
15

Total acid.
Free Hcl.

Hours:	1/4	1/2	3/4	I	1¼	1½	1¾	II	2¼
Free Hcl.	2	5	10	25	45	50	37.5	25	10
Total acid	12	22	22	45	55	70	45	40	15
Occult blood	0	±	+	+	+	+	+	+	+
Bile	+	+	+	+	+	+	+	+	+
Mucus	0	±	+	+	+	+	++	++	++
Amt. in cc.	12	10	10	10	14	9	9	9	10 = 93cc ∴ 257cc passed in 2¼ hrs.
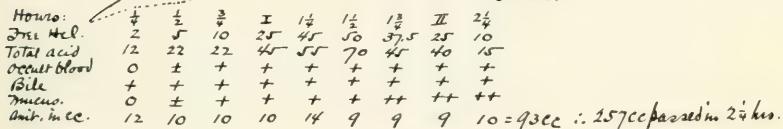
Chart No. VI   Case # II   Mrs. A.E.Z.   Jan. 12th 1917.

Spinal Syphilis.
12 hours before acute gastric crisis
with acute dilatation of stomach.
Note 1st hour hyperchlorhydria
and compare with charts No
made when in fair health.

Secretory meal
Bread 50 gms.
Water 350 cc.

Acidity %.
90
75
60
45
30
15

Duodenal juice showed
normal activity of
Pancreatic enzymes.

Total acidity.
Free Hcl.

Hours:	1/4	1/2	3/4	I	1¼	1½	1¾	II	2½
Free Hcl.	20	45	55	57	55	30	10	0	0
Total acid	37	70	80	82	82	45	25	10	10
Occult blood	+	+	+	++	++	++	++	++	++
Bile	+	+	+	+	+	+	+	+	+
Mucus	±	±	±	±	±	±	±	±	±
Amt. in cc.	11	13	16	16	12	15	14	14	10 = 121cc ∴ 229 cc passed in 2¼ hours.
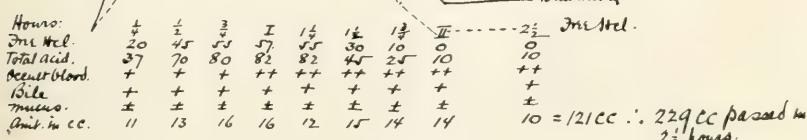
Chart No. VII   Case # II   Mrs. A E Z   April 11. 1917

10 hour fasting Residuum
after motor meal.
20 cc mucoid bile stained
fluid. No food rests.
Free Hcl. 0 Total acid 10.
Occult blood : Positive. (B).

Spinal Syphilis.
4 mos. after Gastric Crisis
11 weeks after gastro-
Enterostomy for duodenal
ulcer, and appendectomy.

Chart shows Subacidity
(Cf. with chart No.)
Biliary regurgitation.
Congestion.
Hyperomotility.

Secretory test meal
Bread. 50 gms.
Water. 350 cc.

{ Patient Nervous and tube withdrawn.
{ Stomach empty. Emptied by lavage.

Acidity %
30

15

.... Total acid.
------- Free Hcl.

| Hours.	¼	½	¾	I	⅛
Free Hcl.	0	5	15	10	10
Total acid	12	20	30	20	20
Occult blood	±	±	±	+	+
Bile	+	+	+	++	++
Mucus.	0	0	0	0	0
Amt. in cc.	16	16	18	18	5 = 73cc

277 cc passed in 1½ hours.
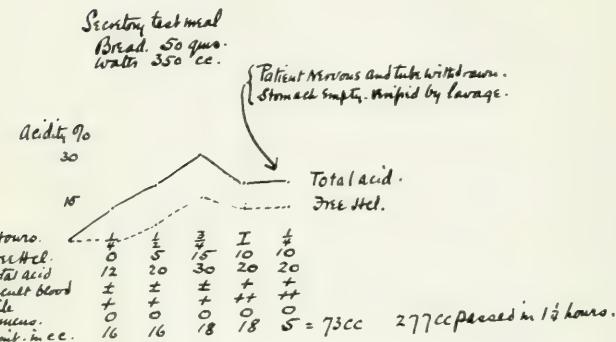
Chart No. VIII   Case # III   Mr. O. S.   March. 15. 1916.

12 hour fasting Residuum
after motor meal.
35 cc grey mucoid.
No food rests, No occult blood
Free Hcl. 20 Total acid 35

Spinal Syphilis.
1 week after Gastric Crisis.

Chart shows moderately Subacid
1st hour phase with a marked
hyperchlorhydric 2nd and 3rd
hour phase.

Acidity %
105

90   Secretory meal.
     Bread 50 gms.
75   Water 350 cc.

60

45

30

15

Straight line =
Total acidity %

Dotted line =
Free Hcl.

Hours.	¼	½	¾	I	1¼	1½	1¾	II	2¼	2½	2¾	III	3¼
Free Hcl.	10	15	20	10	55	60	60	60	75	75	75	60	25
Total acid.	25	25	40	32	75	75	80	80	100	95	95	80	45
Occult blood	0	0	0	0	0	0	0	0	0	0	0	0	0

Rennin Zymogen in mixed filtrate = zero
Starch digestion " " " : retarded.
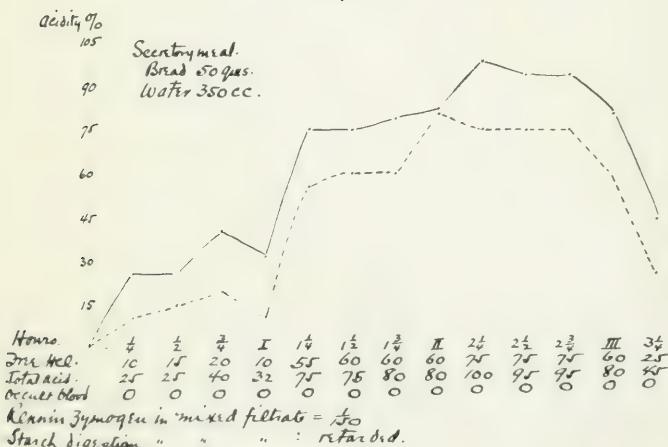
Chart No. IX   Case #III   Mr. O.S.   April 15. 19.7

Spinal Syphilis
4 mos. after last Gastric crisis.

12 hour fasting Residuum
after motor meal.
30cc. grey mucoid.
No food rests. occult blood 0
Free Hcl. o Total acid 10

Chart shows a Subacid gastritis
with moderate motor delay.
Note complete absence of intense
Hyperchlorrhydric phase during
second and third hour as seen in
chart No.

Acidity %
    90

    75   Scentory Test meal.
            Bread 50 gms.
    60   Water 350 cc.

    45   Stomach Empty. Confirmed by Lavage

    30

    .5

Hours: ¼   ½   ¾   I   1¼   1½   1¾   II   2¼
Free Hcl.   0   5   10   15   20   15   5   5   5
Total acid   10   15   25   35   40   35   25   25   25
Occult blood   0   0   0   0   ±   ±   ±   +   +
Bile   0   0   0   0   0   0   0   0   0
mucus   0   0   0   +   +   +   +   +   +
Amt. in cc.   15   16   12   10   15   8   10   8   25 = 119cc ∴ 231cc passed out in 2¼ hours.
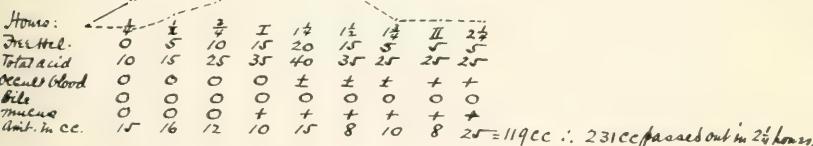
gastric colic, in which without apparent cause there occur attacks of loud eructations of odorless and tasteless gases for several days, but unaccompanied by vomiting. This type was noted in both Case I and Case II.

Again, there is a mild form of gastric crisis, featured by sudden easy and apparently causeless vomiting, independent entirely of food-taking, or the character of the food. This vomiting is spontaneous, painless, may occur several times a day for several days and the vomitus may be gastric or biliary, may be practically odorless and taste-less, or may be sour, fermentative, bitter or rancid, depending upon the state of the gastric motility and chemistry, and yet apparently is not primarily dependent upon these as causative factors. This type of crisis was also noted in Case II.

Close analysis of these lump sensations leads me to suspect that they represent spasm of different segments of the alimentary canal, perhaps, at Keith's nodal points,[40] namely, at the juncture of the œsophagus and the stomach (the cardia), at the pylorus, at various levels of the duodenum, and at the duodeno-jejunal juncture in gastric crises, and segmental spasms of the gut lower down in intestinal crises.

Where spasm occurs *at only one point at a time* the lump sensa-tion may be comparatively mild, and when accompanied and relieved by belching is not featured so conspicuously by the sensation of upper abdominal pressure-fulness. Where, however, two points of the ali-mentary canal are simultaneously in a state of spasm the segment of the alimentary canal between these points is placed under a greater degree of tension (*e.g.,* increased intragastric tension) with a resultant sense of pressure-fulness of various degrees advancing to a status of real pain. An attractive explanation of the mechanism of this con-dition might be worked out according to the hypothesis laid down by Meltzer [41] in his law of contrary innervation. The commonest points of spasm in gastric crises are at the cardia, at the pylorus or at various levels of the duodenum. When such spasm occurs simul-taneously there results a sudden rise in intragastric pressure, often with pain, which I assume must be in proportion to the degree of spasm and to its duration.

As a result of this increased intragastric tension the stomach distends more or less, with different degrees of pressure-fulness felt

in the abdominal zones occupied by the individual stomach when properly or abnormally placed.

During this period of moderate gastric distention no serious harm is done, provided one or the other spastic points relaxes, for then gas is passed by noisy eructations, if the cardiospasm relaxes first (which is more common and more favorable) or the gas is passed from the stomach into the intestines, if the pylorospasm is relaxed before the cardia. But where *simultaneous* cardio- and pylorospasm persist for long, whether or not dilatation of the stomach results will depend upon two factors; the degree of the intragastric pressure and the integrity of the gastric musculature. When the compensation limit of the individual muscle-bundles is exhausted, the muscle tonus gradually or suddenly fails, partially or totally, and various degrees of dilatation of the stomach will result—even to complete muscle paresis.

There are other factors which enter into the degree of intragastric tension as presented above, as, for instance, the presence or absence of food in the stomach at the time such intragastric tension is raised; the secretory responses of the stomach to this food; the chemical reactions taking place from this admixture of food and gastric juice; and the ability of the chyme to develop and liberate gases from the volatile non-organic acids (butyric, acetic, etc.).

In the study of the writer's cases the acute attacks were quite as apt to occur in the fasting state as on a full stomach and appeared to bear little or no relation to food-taking.

This theory, outlined above, presents another view of the pathology or disturbed physiology occurring in gastric crises, and also admits another explanation of the causation of the pain—a pain due in part to that caused by simultaneous double spasm and in part the result of the increase in intragastric tension.

It will be of value in cases of gastric crises to test out the degree of intragastric tension by the tambour-kymographic method.[42]

In the earlier observations on cases of gastric crises attempts were made to explain the cause of pain as a result of hyperchlorhydria, and Sahli,[43] in 1885, published such a hypothesis, which was later apparently confirmed by others.[44, 45, 46] This conception was subsequently overthrown by Boas[47] and by von Noorden,[48] who studied the gastric secretion before, during and after the crises and independently came to the conclusion that there was no characteristic

secretory error which could be considered pathognomonic. This view has been endorsed by many writers—Babon,[49] Buchard and Bovet,[50] and more recently by Friedenwald and Leitz.[51] These analyses were all interpreted, however, in the light of fifty- or sixty-minute extraction of an Ewald test breakfast. In the writer's three cases fractional gastric studies were made between and during the crises in two cases and in one patient, too sick to permit of such a study during the crises, only the secretory condition between attacks could be ascertained.

A comparison of these fractional analyses (cf. Charts No. V, VI, VII, VIII, and IX) shows such a lack of uniformity that I am led to the belief that the character of the secretory response is modified by associated organic defects or functional disturbances exhibited by the individual patient. Thus in Case I there appear to be pyloric or prepyloric erosions or ulcerations as suggested by the fasting stomach extractions (cf. Charts I to IV), and the fractional curve (cf. Chart V), which show a moderate hyperchlorhydria and rather constant findings of chemically altered blood. The X-ray study by Dr. Willis F. Manges, substantiates this view. In Case II an organic lesion also existed, a duodenal stricture in the second portion of the duodenum being found at operation, a stricture presumably caused by an active bleeding ulcer, showing great constancy of occult blood findings recoverable from the stomach on account of the constantly patulous pylorus, and the dilatation of the duodenum. While the fractional curve from this patient between the attacks of gastric crises (cf. Chart VI) might suggest the curve of duodenal ulcer, yet the analysis (cf. Chart VII) made just as an acute crisis was developing is so radically different as to lead the writer to the belief that it has some diagnostic significance, and that hyperacidity may be a factor in initiating an attack, or it may at least furnish one explanation of the cause of the pain by inducing the condition of painful double-point spasm. However, it will not be possible to determine the period of the digestive cycle in which this hyperacidity may be detected, unless the analysis is carried out by the fractional method. Case III very definitely showed a hyperchlorhydria in the second and third hour phases just after an attack (cf. Chart No. IX), which is quite different from the condition found one year later when the patient was in relatively good health, and had been free from attacks for four months. I believe that if more cases can be

studied by the fractional method a final conclusion might be arrived at as to what part secretory errors play in inducing an attack and whether or not they influence the character of the pain. Certainly, the fractional method helps the better to rule out concomitant organic disease with its associated symptomatology.

At this point it may not be amiss to call attention to other causes suggested for the production of pain occurring in gastric crises.

In those cases primarily associated with pain, and of the most agonizing variety, it seems most plausible to believe them due to a painful irritation of the sensory fibres of the great splanchnic nerve which emerges from the spinal cord at the level of the fifth to tenth or eleventh dorsal vertebræ, and thus represents the posterior nerve roots of the third to the eighth or ninth thoracic nerves. Castelli and Pinel[53] direct our attention to the fact that the great splanchnic nerve is composed of two kinds of fibres: large numbers of thin fibres which do not possess a myelin sheath, and large myelenic fibres which are less abundant.

(a) These thin amyelin fibres are centrifugal fibres, originate in the medulla, pass down through the cord, leave by way of the posterior nerve root, and pass through the spinal ganglion without interrupting their continuity, and continue their course in the great splanchnic nerve.

(b) The large myelenic fibres are centripetal and degenerate after section of the posterior nerve roots, especially if the spinal ganglion is excised, but do not degenerate if the great splanchnic nerve is cut beyond the spinal ganglion. These myelenic fibres are sensitive fibres and Kolliker has experimentally traced them in the cat and has seen them end in the corpuscles of Pacini. Consequently, both the painful irritation and the destruction of these myelenic fibres takes place between the spinal ganglion (from which they originate) and the medulla, and it is, therefore, a painful irritation of these large myelenic fibres which determines the pain in gastric crises.

Besides this anatomical proof that the gastric crises originate in these dorsal posterior roots, Castelli and Pinel point to the clinical corroboration of it in the sensory disturbance of the fourth to the tenth intracostal nerves, which may give rise to either a thoracic anæsthesia, hypoæsthesia, or a painful hyperæsthesia, which later can

be aborted, as Loring has demonstrated, by injecting cocaine into the muscle over the origin of the nerve.   Finally, Castelli and Pinel consider it anatomically and clinically demonstrated that gastric crises (in so far as pain is concerned) are secondary to the painful irritation of the dorsal nerve roots, which not only furnish the sensibility of the intercostal nerves, but also the sensitive fibres running to the gastric mucous membrane; that simultaneous irritation of these fibres results in producing both intercostal (girdle) and gastric pain which they believe may initiate the bulbar reflex of vomiting, and they, therefore, endorse only such surgical measures as involve sectioning of the posterior nerve roots in the dorsal region, and they propose a new operation which consists of ligating (rather than cutting) the posterior nerve roots extradurally and as far above the spinal ganglion as is possible.

Many other writers are in agreement with this conception of the origin of pain, among whom may be mentioned Forster,[53] who in 1908 was the first surgeon to section intradurally the posterior nerve roots for the relief of gastric crises.   Guleke,[54] who first suggested the extradural route, and Frazier,[55] who states that he personally is " quite prepared to advocate rhizotomy as a means of relieving pain in suitable cases and where other measures have failed."   Franke,[56] however, recommends the extirpation of the posterior roots by avulsion of the intercostal nerves without entering the vertebral canal, and reports cases successfully cured thereby.   Castelli and Pinel, however, criticize this method as being illogical, assuming the correctness of their proof that the chief sensory fibres to the stomach originate in the spinal ganglion, and therefore the nerve section should be made above this point; and they furthermore call attention to the frequency with which a double pneumothorax results after the Franke operation.

Hanel [57] endorses the value of a simple decompressive laminectomy without sectioning the posterior roots.   All these men report cases successfully treated by their method.   Opposed to this it is interesting to note that Eppinger and Hess [58] conclude from their physiological experiments that the pain in gastric crises is due to painful irritation of the vagus nerve rather than to pain emanating from the posterior nerve roots, thus laying greater stress on the motor, rather than the sensory innervation, and in line with this Exner [59] has sec-

tioned both vagi at the level of the cardia, following this with a gastro-enterostomy and the introduction of a drainage tube into the duodenum, and has reported relief from the pain of gastric crises, although his operation often results in a total motor paralysis of the stomach.

Working from a different hypothesis as to the origin of the pain, Vallas and Cotte,[60] in 1906 reported a cessation of gastric crises in a patient upon whom they separated the solar plexus from the cœliac axis and stretched it. This operation, one of the earliest, has received little endorsement and has apparently not been repeated.

From all of this it will be seen that there is a considerable lack of harmony and unanimity of opinion as to which of the surgical procedures lends itself best to the relief of gastric crises. Those operations seem more rational which involve sectioning of the posterior nerve root as far above the spinal ganglion as it is possible without entering the dura, provided a sufficient number of dorsal roots are cut, by which I mean *all* of the dorsal posterior roots which are concerned in the sensory innervation of the stomach should be sectioned, if this source of the pain is to be completely abolished. However, we must remember that there certainly appear to be at least two, and possibly more, sources of pain in gastric crises, namely pain originating from the posterior thoracic nerve roots and from the few sensory fibres carried to the stomach by the vagus, and we should recognize clearly which type we are dealing with *before any operation can be considered.* Again, we should bear in mind that it appears to be the nature of this condition to appear suddenly like a bolt out of the blue, to continue for many months or years and then to suddenly and spontaneously disappear (even in untreated cases) never to be seen again. May not this be due to a gradual but total progressive degeneration of the sensory fibres as a result of the natural evolution of the disease? Surely unless the urgency of relief from pain is very great and the patient reduced to a state of extreme chronic invalidism (perhaps addicted to morphine), it seems to me wiser to adopt other palliative treatment for the relief of the pain and institute intensive syphilitic therapy, for even in the event of successful surgery it merely results in the relief of the painful crises, but does not serve to arrest the progress of the disease.

In addition to the causes of pain as reviewed above, Barker [61]

believes that part of the pain is due to a paroxysmal arteriospasm with hypertension, because he has noted a subsidence of the painful crises as the blood-pressure was reduced to normal under nitrite medication. Likewise, Holmes [62] has noted in cases of gastric crises that there is an elevation of blood-pressure coincident with the pain which can be reduced, with almost immediate cessation of pain, by the intramuscular injection of 0.5 c.c. of a 1/1000 solution of adrenalin, which therefore acts as a depressor to the blood-pressure, not only in the gastric crises of spinal syphilis, but also in cerebral syphilis, in dementia præcox and in pregnant women, and he believes that the toxic cause of the acute attack of gastric crises, as well as the failure of the normal pressor reaction of adrenalin, lies in the presence in the stools of a large amount of Beta-aminazolyl ethylamine, which is recoverable from the stools during the acute attack, and disappears from the stools after and between the attacks. *He therefore suggests the use of adrenalin not only as a therapeutic measure for pain relief but also as a diagnostic method of differentiating the pain of gastric crises from that of abdominal surgical disease.*

In support of this source of pain Pal [63] believes that the rise in blood-pressure is due to vasoconstriction of the splanchnic blood-vessels, which causes an anæmic condition of the small arterioles with consequent back pressure on the mesenteric arteries, which serves to dilate them and stretches their surrounding nerve plexuses, and he charges these vasoconstrictor phenomena to lesions of the posterior dorsal roots. Finally, von Leyden [64] believes the pain of gastric crises is due to a neuralgia of the cœliac plexus.

As stated earlier in this paper gastric crises appear in tabes with considerable frequency, probably one out of every third or fourth case will present this complication. Among different writers the frequency varies from a low estimate of Hunt,[65] who considers they occur in only six per cent. of cases, and of Lucke,[66] who found only twelve per cent. of tabetic patients, in a series of 250 cases studied, presented visceral crises, in which gastric crises predominated—to high estimates of Roestel,[67] who concludes that thirty per cent. of all cases of tabes are complicated by gastric crises, and Mott,[68] who found gastric crises—occurring frequently as the initial symptom—in thirty-five per cent. of his sixty cases. In a study of 1000 tabetics Nuzum [69] found visceral crises—chiefly gastric—occurred in 22 per cent. Out

of this series of 1000 cases 97 were operated on under mistaken diagnoses on account of the painful crises.

Of these 97 cases the crises in 17 per cent. represented the *initial symptom* of the disease. This is rather higher than the percentages given by other writers. Friedenwald and Leitz [70] found gastric crises occurring as the initial symptom in 13 per cent. of a series of 42 cases studied; Fournier [71] quoted it as the initial symptom in 7 per cent. of 311 cases studied; Erp [72] noted it in only 2.5 per cent. of 400 cases and Lucke [73] noted visceral crises as the initial symptom in 4.8 per cent. of 250 cases.

Where gastric crises appear as the initial symptom of tabes these cases will prove the most difficult ones to diagnose, except by means of lumbar puncture and spinal fluid analysis, inasmuch as all other symptoms of tabes may be lacking. It teaches us, however, the need of being on the alert for this possibility. If we can rule out syphilis, tuberculosis and cancer in every patient who presents, we have done a good day's work and have reduced our diagnostic possibilities by at least 50 per cent.

Probably one of the most important points to guard against is to avoid being misled into expressing an opinion that the pain of gastric crises means surgical disease of the abdomen, and warrants exploratory operation. Even a cursory review of the literature testifies to the many failures to discover surgical pathology on the operating table.[74] Debove [75] relates the case of a patient successively operated on for appendicitis, cholelithiasis and movable kidney without relief of the painful symptoms in a case of tabes. Nuzum, in his study of a thousand tabetics, found that 97 (or nearly 1 in every 10) had been operated on under the mistaken diagnosis that the gastric crises was an expression of some form of abdominal surgical disease and yet nothing was found intra-abdominally to account for the symptoms, and he states " that mistaken diagnoses and resulting operations occur chiefly through failure to examine the nervous system."

In these mistaken diagnoses the upper abdominal surgical possibilities are the commonest pitfalls; ulcer of stomach or duodenum, gall-bladder and gall-duct disease and appendicitis contribute the greatest number of errors in diagnoses; with renal calculi and ptoses, and ureteral kinks, intestinal obstruction, pancreatitis, salpingitis, ectopic gestation, and postoperative adhesions occupying unenviable

positions in the error column. In short, almost every abdominal surgical condition has been suspected.

On the other hand, we must also not forget the possibility that organic surgical disease of the stomach, duodenum *et al.* may exist co-incidently with gastric crises as in both Case I and Case II of the writer's series.

Diagnosis.—As stated earlier the diagnosis in a good many cases will be absurdly easy, and in other cases most exceedingly difficult. If the patient is observed in his first attack of gastric crisis, and especially if this gastric crisis presents as the initial symptom of a cerebrospinal syphilis, a positive diagnosis cannot be made without a serological, chemical and cytological examination of the spinal fluid. Of course, the doctor who has seen a sufficient number of such cases to have had the peculiar symptomatology impressed upon his attention may correctly hazard a guess. It is not possible in a paper of this length to do more than scan the fringes of differential diagnosis.

A carefully taken history will naturally throw much light upon the relative importance of the diagnostic possibilities concerned in any given case. If a preceding luetic infection is admitted gastric crises *should always be considered.*

While the usual trinity of symptoms consists of pain, vomiting and disturbances of gastric secretion, they are by no means always present in any given case; one or two may be lacking, and even if all three are present, such symptoms may occur in many other conditions.

It is sometimes easier to make the diagnosis *after* the attack is over than during its acute phases. The suddenness of onset, the severity of the symptoms (when they are severe) and their equally sudden remission with the rapid restoration to a state of good health, in a condition which may simulate any form of abdominal surgical disease, is very significant. The diagnostic finesse in the initial attack, however, concerns itself chiefly with the period of acute symptoms. The absence of leucocytosis will be helpful, but even if present may represent some associated infection and does not exclude the underlying condition. The use of the adrenalin reaction, if it runs true to form, suggested by Holmes, should prove an especially useful and simple aid in the diagnosis.

The examination of the spinal fluid is the *sine qua non.* In the majority of cases of spinal syphilis it will show a pleocytosis, an

excess of globulin, and a positive Wassermann reaction. Until this has been made it is often wiser to maintain an attitude of masterful inactivity, or watchful waiting, if we would avoid the humiliation of an unjustifiable exploratory laparotomy. Fordyce[76] and others endorse the value of the Lange or colloidal gold test of the spinal fluid to distinguish true paresis from simulating types of cerebrospinal syphilis.

Where gastric crises do not appear as the initial symptom of spinal syphilis, the diagnosis is often clarified by an examination of the nervous system. Irregularities in the size and outline of the pupils, or still better an Argyl-Robertson pupil; a positive Romberg sign; the absence of one or both knee-jerks (Westphal's sign) or a break in the arc of other of the deep reflexes (absence of the Achilles tendon reflex, etc.); a thoracic zone of hyperæsthesia or anæsthesia, unilateral or bilateral, will make the examination of the spinal fluid yield largely corroborative testimony. Transitory ocular squint or lesions of the auditory nerve are frequently monosymptomatic forerunners of tabes and should receive more than passing attention.

Prognosis.—The prognosis is generally serious and often extremely bad. This prognosis concerns the condition of cerebrospinal syphilis, but not necessarily the symptoms included in the term gastric crisis. Within the writer's knowledge of the literature no case of a death from the gastric crises *per se* has been noted. On the other hand, laryngeal crises may and have resulted in death from asphyxia, and was imminently threatened in Case I. It is not possible to prognosticate the duration of any given attack, its possible severity or its frequency of reappearance. When gastric crises have once made their appearance they are most apt to recur, and in untreated cases theoretically should continue to do so until the progress of the disease has entirely obliterated the sensory paths to the stomach. Such spontaneous cessation of attacks of gastric crises is comparatively rare, although Basch[77] reports two such cases and quotes von Leyden as having supplied two more.

The unfortunate victim of tabes with initial gastric crises may derive at least some comfort from Benedict's[78] observations that such cases rarely show locomotor symptoms.

There are two distinct phases of the treatment of gastric crises. The first is directed to the amelioration or control of symptoms during

the acute attack, and the second concerns the management of the patient between the attacks.

Summed up the treatment should aim to shorten and lessen the severity of the attacks; to prolong the interval between the attacks; to build up the body defenses and to improve the balance of reserve so that future attacks may be less severe; and above all to initiate and continue antisyphilitic therapy in the attempt to arrest the progress of the disease.

Treatment of the Acute Attack.—To save the interested reader a laborious search into the large amount of literature on the subject, it may help to briefly run over some of the suggested measures for the relief of this condition before coming to a consideration of the writer's personal experiences with cases of gastric crises.

Cerium oxalate has been extensively tried both for the relief of pain and for vomiting with varying endorsements. Lockwood [70] states that it has been worthless in his hands. Ostankow [80] reported good results from its use, which led Basch to try it in 18 cases. He gave it in doses of 0.1 gm. (gr. ½) every two to four hours during the attack and three times a day between the attacks, and found that it did not in any sense relieve the pain but helped control the nausea and vomiting. He likewise tried the effect of *antipyrin* as recommended by Gowers [81] and Zippert,[82] giving it in doses of 0.25 gm. (gr. iv.), repeated hourly for four doses, and if no symptoms of circulatory depression occurred he increased the dose to 0.5 gm. or 0.1 gm. (gr. vii–½ to xv.). He came to the conclusion that it acts as a general sedative, especially in those cases with pain, but had no effect in controlling vomiting.

Carrying out a suggestion of Oppenheim,[83] Basch tried the subcutaneous injection of 0.002 gm. (gr. 1/30) of *nitrate of strychnine* in five cases which showed no improvement after either cerium oxalate or antipyrin, and in two cases secured relief from pain and restful, but had no satisfactory effect in the other three.

Hunt mentions the use of *injections of cocaine* into the epidural and subarachnoid spaces of the spinal canal, as suggested by Oppenheim,[84] and a similar use of *alcohol* and *storain* as recommended by Levy and Pope.[84] He also mentions the use of *methylene blue* in one-grain capsules.

Veronal and *trional* [85] in combination in a dosage of gr. ii ½ each,

if given every two to four hours, calms the pains and induces restful sleep when the attack is over. Lockwood also advocated larger doses of antipyrine, gm. 1 (grs. xv), given by the bowel, every four to six hours.

Cannabis indica and (or) *belladonna* to control hypersecretion, and the *bromides, chloroform, cocaine,* and *alkaloids of opium* to control pain have been tried with success by Friedenwald and Leitz. They also recommend the external application of *sprays of ether* or *ice,* or *X-ray,* or *radium* applications to the epigastrium, or the use of the *galvanic current* with a milliamperage of 10 to 15, and the negative pole applied to the abdomen and the positive pole over the dorsal vertebræ.

Finally, in most cases, one must have recourse to hypodermics of *morphine,* which should be used cautiously and sparingly on account of the danger of habit formation, to which such sufferers are extremely susceptible—and when given it should be under the personal supervision of a physician.

The injection of *adrenalin chloride* [86] in 0.5 c.c. of 1/1000 solution should be tried, since it is safe and claimed to be efficient in the relief of pain and is, therefore, worth a trial before morphine. It is well to be familiar with the range of blood-pressure in the individual case and to reserve the use of adrenalin for such cases as exhibit a hypertension during the attack. Likewise the *vasodilators* (sodium nitrite, amyl nitrite, etc.) may be tried as recommended by Barker [87] and Raymond,[88] in those cases of hypertension in which the pain is contributed to by arteriospasm.

The writer's method of treatment *during acute attacks* is as follows:

Absolute bed-rest; elevation of the foot of the bed 8 to 12 inches to guard against dilation of the stomach, which is not uncommon. Absolutely no food by mouth. The patient may be allowed to suck cracked ice, to which may be added two or three teaspoonfuls of brandy or crême de menthe if there is pronounced nausea. The mouth may be swabbed out with a mixture of one ounce of glycerin and the juice of one lemon. If vomiting is a feature of the attack the stomach should be emptied by means of a duodenal tube and syringe aspiration. An analysis of the aspirated fluid to some extent will determine the chemistry of the lavaging fluid. If such an analysis cannot be done at once, plain water is the safest lavaging fluid. After the stomach has

been gently washed with one-half to one litre of fluid by alternate syringe injection and aspiration, the tube is left *in situ* at the proper level, and securely strapped to the patient's chin or cheek by adhesive plaster. The proximal end of the tube is attached to one of the horizontal arms of a small T-tube, to the other horizontal limb of which is attached rubber tubing running to an outflow pail, and the vertical end of the T-tube is attached by means of rubber tubing to an irrigating tank of one to two litres' capacity, suspended two to three feet above the patient's head. A pressure clamp should be placed over the rubber tubing between the irrigating tank and the T-tube and a second one between the T-tube and the outflow pail. By alternately releasing pressure on the tube from the irrigating tank and the tube running to the outflow pail, the patient's stomach can be continuously and gently lavaged and aspirated by siphonage. The lavaging fluids should be warmed to body heat, and should consist of plain water, 1/10 normal solution of soda bicarbonate, or normal salt solution to which 5 per cent. of glucose may later be added should there be evidence of acidosis. *The writer cannot emphasize too strongly the value of this continuous method of lavage.* This measure is as a rule easily tolerated, usually controls the vomiting and prevents cardiac strain or injury to the gastric mucosa from continuous retching. If there is evident hypersecretion, hypodermics of atropin sulphate may be injected subcutaneously in dosage of gms. .0006 (gr. 1/100) every hour until three doses have been given and then every three hours, or after one or two injections have been given 30 to 60 minims of the tincture of belladonna may be added to each litre of the irrigating fluid. This will control the hypersecretion and relieve or prevent pylorospasm and the pain due to it. If there is marked gastric hyperæsthesia one or two ounces (mils 30 to 60) of olive oil containing 2 to 3 per cent. of anæsthesia may be introduced through the duodenal tube, or 0.3 to 0.6 gm. (grs. v to x) of chlorotone may be dissolved in 60 to 90 mils (2 to 3 ounces) of water and may be similarly introduced.

(*To be concluded.*)

INTESTINAL OBSTRUCTION, EXPERIMENTAL RESEARCH *

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THE late international unpleasantness caused as complete a change in the life and work of the laboratory as it did in the habits of the general practitioner; I am therefore unable to regale you with accounts of new experimental facts concerning the problem of intestinal obstruction. But just as the practitioner's office, after standing vacant for two years, needs a thorough cleaning, and during the cleaning process much that now appears utterly useless will be thrown out, so the first thing to do in the laboratory is to take out and polish up the collection of suppositions, the working hypotheses, from which the experimentalist must start when planning a trip into unexplored regions. I trust that it will interest you, then, to listen to a recapitulation of the ideas which have developed and the conclusions which must logically follow from a consideration of what we know of the problem.

My remarks will be limited to the condition of high obstruction; the peculiar picture in this condition has been of great interest to experimental workers; the other conditions of obstruction do not in themselves present problems apart from the fundamental one, perhaps, of malignant growth. I was actively engaged in a study of the question with Dr. B. M. Hendrix, of the Department of Physiological Chemistry of the University of Pennsylvania, at the time when I was called into active service; our findings have never been published, and I will present them to you, so that not all of what you must hear from me will be a review.

There are certain problems which at first sight seem to interest the research worker out of all due proportion to their practical, everyday importance; one such is the problem of diabetes, which has been the centre of an enormous amount of work. This is to be explained, however, by the fact that all this work is really centring around the

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great problem of glucose metabolism, and that the disease, diabetes, is merely one of the ways of approach. The importance of the glucose problem is evident from a consideration of the probability that all of our food which is destined for energy production, that is, the great bulk of our food, ultimately becomes glucose before being transformed into energy.

The problem of the cause of death in high obstruction is, to my way of thinking, of a similar nature. It does not particularly interest the clinician, except the surgeon, and when he sees it, all possibility of prophylaxis is gone, he must treat the fully developed condition; and the treatment is also clearly laid out—to relieve the obstruction. Still, I believe that the matter is of every-day interest to the general practitioner; so-called intestinal intoxication is a common condition— were it not for sadly mixing the metaphor, one might call it the general practitioner's bread, with the common cold for his butter. In acute high obstruction we see a toxic condition developing in eighteen hours which can only be designated as a tragedy; if in eighteen hours of complete obstruction enough poison is formed somewhere to give this picture, must we not think what may happen in two hours of stasis? I can see no reason why one-ninth as much poison would not form in these two hours of stasis, and be formed day after day, with the production of some chronic picture. Therefore I think it not unlikely that the solution of the problem of high obstruction will bring with it the answer to the common question of intestinal stasis.

The problem of high obstruction is as follows: If an obstruction occur at the pylorus, as we see every day, nothing happens of an acute nature, the patient presents the picture of a slow death from inanition. If the obstruction to the intestinal tract occur at the opposed end of the intestinal tract, the same picture of gradual, chronic disease presents itself; the same is true of obstruction in the sigmoid, or of obstruction at the ileocæcal junction. Do not mistake me that I am saying that obstruction at these different levels of the bowel presents the same clinical picture. What I mean is that obstruction at the pylorus, at the ileocæcal region, in the sigmoid or in the rectum, gives a picture of chronic disease, as contrasted with the acute picture following high obstruction.

The acute problem lies, therefore, clinically, between the pylorus and the ileocæcal region. It was shown experimentally by Halstead

many years ago, that a portion of the lower ileum could be isolated and left in the body for long periods, with no untoward results. The acute problem lies, therefore, experimentally, even above the ileum. In recent years it has been shown that the source of the poison can be limited to the first 34 cm. of the small intestine of the dog—that is, to that portion which corresponds roughly to the anatomical limits of the duodenum. This is so definite that the hypothesis developed from this work that the poison found in acute high obstruction is a normal product of the duodenum, and that it is normally destroyed in the jejunum; according to this theory then, we are not dealing in acute obstruction with the formation of a new poison, but the obstruction has merely interfered with the normal process of the destruction of a poison normally formed, and always present in the upper gut.

This point is deserving of especial emphasis to the general practitioner. There is no demonstrable source of toxin formation in the lower portion of the gastro-intestinal tract, from the beginning of the ileum, perhaps, to the anus. Closed loops of these areas, ileum or colon, can be made, and the enclosed content develops no evidence of toxicity; animals so treated, the gut being made continuous around the closed loop by an entero-enterostomy, develop no untoward symptoms. This in spite of the fact that all the clinical efforts in connection with intestinal toxæmias have been directed to the lower bowel, to the particular area which, experimentally, yields nothing whatever. This clinical insistence is perhaps due to the success of the common treatment with cathartics for relieving this condition, even though it would doubtless be generally admitted that cathartics do something more than to empty the lower bowel; and even if that is all they did, the emptying of the large bowel doubtless has its reflex effect upon the upper small intestine. I personally believe that the reason that Lane's operation, the lactic acid bacillus, and all of these things have fallen into disuse, is a very simple reason—they are all directed at the wrong end of affairs, and can therefore be only symptomatic treatments at best.

Experimental work has thus determined very definitely the geographic location of the poison; the actual source and the actual character of the toxin have not been so easy to locate. Connected with the duodenum are the stomach, the liver and the pancreas, and the mucosa of the wall becomes the fourth possible source. Each of these four

structures—the stomach, the liver, the pancreas, the mucous membrane of the gut itself—have all been suspected by different groups of workers; and a fifth possibility must be considered, that this portion of the bowel is an excreting as well as a secreting organ, and that the poison is merely excreted from an unknown source elsewhere in the body.

It has been clearly shown that the toxin belongs to the class of the so-called protein poisons, and it is therefore related to a class concerning which the chemists are not yet agreed. There are chemists who hold that the products formed at certain stages of the breakdown of the protein molecule are in themselves toxic; these chemists point to the toxicity of the proteoses and the amines, and to the toxicity of the choline bases, formed in a similar manner on the breakdown of lecithin by lipase. Another group believes that the pure proteoses, etc., are not poisonous; that the evident toxicity is due to their property of attracting toxic substances which adhere to their molecules with great tenacity, requiring a further disintegration before they are broken away. However this may be, the poison found in high obstruction is related to the toxic proteoses and to the cause of death in anaphylactic shock, and the pictures at autopsy of all these conditions have much in common.

Certain workers have found a poison of this nature in the content of the stomach; this work has not been repeated particularly, although Doctor Hendrix and I have found something of this order, yet not constantly. The main reason for ruling out the stomach as the source of the poison is, I feel, the clinical fact that pyloric obstruction does not give a picture characterized by intoxication. The liver has been considered as the source of the poison, in view of the well-known power of the liver as an excretory organ; but it has not been shown that the liver has anything to do with the condition.

There remain, then, two organs, the pancreas and the gut itself. The mucosa of the wall of the intestine has been most frequently looked upon as the source of the toxin, particularly in view of certain experiments in which the destruction of the mucosa within a closed loop resulted in the finding of none of the characteristic poison within the content of the loop; others have seen in the necrosis of the membrane the source of the toxin.

The pancreas has been suspected because of the similarity between

the clinical pictures of high obstruction and acute pancreatitis; and there can be no doubt of the fact that the pictures are similar because they are produced by poisons of the same chemical nature, even if they be not identical—in pancreatitis a protein poison arising from the action of the proteolytic ferment of the pancreas upon the body cells. But the relation of the pancreas to high obstruction is not so clear.

The work on the necrosis of the mucosa as the source of the toxin, the idea that the intestinal bacteria supply the poison, the ideas of interference with the blood-supply of the gut as being the causative factor, become of difficult explanation, and in fact, the possibility of the toxin arising outside the intestine, forces itself to the front, in view of certain experiments, not published as yet, which were in progress with Doctor Hendrix just before I entered the service. We found that the intestinal content of a normal animal, killed by the action of an intravenous injection of the purified toxin, contains the poison in an amount sufficient to kill another normal animal; therefore we must assume that the poison, on intravenous injection, creates conditions under which it is formed in the gut, or formed elsewhere in the body and excreted into the gut. It is hardly probable that we are dealing with the recovery of the entire injected dose, for the losses on collecting the intestinal content, and the losses by dilution in the blood of the animal are too great.

Furthermore, if the adrenals are removed from an animal, and the intestinal content be chemically worked over after the animal has died as the result of the adrenalectomy, the same poison, or an entirely similar poison is found; in other words, after the removal of the adrenals, conditions are created which favor the appearance of the poison in the intestine, just as in complete obstruction.

Now in neither of these conditions is it at all likely that we are dealing with an interference with the blood-supply of the gut, in the sense of those workers who see in the necrosis of the mucous membrane the source of the toxin; one group considers, for example, that the toxin arises from the necrosis of the infolded ends of the isolated loop. No such condition can exist in the normal animal intravenously poisoned, nor in an animal after adrenalectomy.

As so often happens in research work, the further one goes the more intricate the problem appears, until suddenly, all becomes clear; I feel that the said illumination in this problem of obstruction has

not appeared as yet. Nevertheless, the geographic source of the cause of the symptoms of which Doctor Jump will now speak, has been experimentally located. The reasons for the treatment which Doctor Müller will then explain are based on the presence of an extremely powerful poison formed somehow in the gut above the obstruction; therefore the necessity for the immediate operation which he will doubtless emphasize; therefore the value of the stomach pump, which I trust he will make clear.

ACUTE INTESTINAL OBSTRUCTION—SYMPTOMS AND DIAGNOSIS

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IN this paper our efforts will be directed to a study of the general symptoms of this disorder so that an appreciation of their grave significance may be reached and an early diagnosis made. No attempt will be made to differentiate between the causes of intestinal obstruction nor to specifically localize the portion of bowel affected. It is a lamentable fact that in most cases of acute obstruction no diagnosis has been made until the case is far advanced and in many, not until the terminal symptom of toxæmia has occurred.

The mortality runs above 40 per cent. in reported cases: Moynihan says he would not be surprised if there were four fatal cases for every successful one reported, if all the facts were known, and that he believes any mortality above 10 per cent. should be credited to delay. Deaver and Ross (*Annals of Surgery,* 1915, i, p. 998) state that in their cases which recovered 2½ days had elapsed before operation, and in those which died an average of 4 days had elapsed. This does not mean that one may safely delay operative interference for 2½ days, for in some the toxæmia develops so rapidly that the patient is in a fatal condition before this period has passed. Of such, are those in which the blood supply is cut off early and those which are high in the gut. The higher the obstruction the more fulminating is the case. Early operation would reduce the mortality, for time is the important factor. If the case is delayed till stercoraceous vomiting or toxæmia ensue, the opportune moment for surgical treatment has passed and the patient's chances for recovery lessened. The burden of early diagnosis lies on the family physician and upon him rests the responsibility for calling for surgical interference.

That there is an alarming tendency to persist in medical treatment without relief must be due to the rarity of the disorder and a consequent lack of estimation of its danger. Deaver and Ross report 276 cases in ten years from a busy clinic. If we eliminate the cases

due to strangulated hernia, 156, in which the diagnosis is usually made early, there are left but 120, an average of 12 a year, from other causes. Alexius McGlannan (*Journal A. M. A.,* March 8, 1913, p. 733) reports 181 cases operated upon by various surgeons in twenty years in the St. Agnes and Johns Hopkins Hospitals. So it must occur in the practice of the family physician very infrequently.

We are to-day in about the same position with intestinal obstruction as we were twenty years ago with appendicitis. At that time surgery was the last resort: it may be said in passing that the patient's life is not nearly so much endangered by delay in appendicitis as in intestinal obstruction. In appendicitis many recover without operation, subject, however, to recurrent attacks; while in intestinal obstruction but few recover unless relief is obtained at once and such cases are liable to subsequent attacks. To-day, however, few physicians counsel a delay of even twenty-four hours with appendicitis. The medical man is justified in attempting to relieve the obstruction by lavage and enema.

Purgation *is dangerous* and must not be used. Ochsner has said he has practically no mortality in cases which have not had cathartics and where they are used " they do an enormous amount of harm." The use of purgatives is so customary, however, that in many cases the patient has taken one before his medical adviser is called. If quick and permanent relief from pain, vomiting and constipation have not been obtained by lavage or enema the case is a surgical one and should be treated as such.

Strangulated hernia is the cause of the obstruction in more than half of the cases. In such, the diagnosis should offer few difficulties except in umbilical, ventral and internal hernias, in which the symptoms are often less acute and severe than in other forms. The presence of an irreducible hernia with pain, vomiting and prostration gives us a picture, the interpretation of which admits of no doubt. But even when the diagnosis has been made, there is a tendency to persist in manipulations too long before the condition is considered as surgical. According to Coley, if the strangulation cannot be reduced in 5 minutes by taxis, it is unsafe to continue. This is a short period, but from the surgeon's standpoint, is reasonable, and it is a good rule to follow, for in that time little harm can be done.

Many cases are due to postoperative adhesions. About half the

postoperative cases have had drainage after appendectomy. Again reluctance to consider the case surgical has been detrimental to the patient. Had the appendix been removed early, pus would not have formed, drainage could have been avoided, the amount of adhesions lessened and obstruction probably avoided. In the presence of symptoms of intestinal obstruction an abdominal scar must make the physician consider the possibility of postoperative adhesions and be more alert in the making of his diagnosis.

At the beginning of the obstruction we have pain and vomiting; sometimes one and sometimes the other appearing first. The pain is colic-like and may be temporarily relieved by vomiting. It is usually widespread and not accompanied at the beginning, by any spot of tenderness. There is in most cases marked constipation, which resists repeated enemas. These may cause a movement of the contents of the gut below the obstruction but this does not give relief. Flatus may pass with this movement but does not continue. The inability to pass gas is an important diagnostic sign. In obstruction due to intussusception or intestinal tumor bloody diarrhœa may occur. Vomiting is persistent but not often profuse. It consists of stomach contents at first and later of duodenal and intestinal contents. This may be temporarily relieved by lavage, but soon returns. Fever is seldom present: the patient is usually prostrated.

To repeat, if a patient suffering from these symptoms is not permanently relieved by lavage or effectual enema immediate operation is demanded, for this is the elective period. Shortly, vomiting and pain increase; the vomiting becomes more profuse and finally foul, the so-called fecal vomiting; pain is more continuous, the primary prostration becomes greater and the patient seems to be shocked. There occurs general distention of that side of the abdomen where the obstructed gut lies. Visible peristalsis or visible spastic coils of intestine appear: tenderness over the obstructed coil may be elicited and increased tympany demonstrated.

As the case progresses toxæmia appears and overshadows all other symptoms. It is progressively evident, the pulse becomes rapid and small, respiration quick and shallow, skin clammy, pain lessens or disappears, the patient is delirious or quietly unconscious. He is rapidly approaching his complete dissolution and the opportunity to save a life has passed. The diagnosis must take into considera-

tion *dilatation* of the *stomach, appendicitis, peritonitis,* and *acute pancreatitis.*

In *dilatation* of the *stomach* there is copious vomiting of yellow or green sour fluid, early distention of the epigastrium, restlessness and thirst. Succussion may be elicited over the stomach. Lavage will give relief.

In *appendicitis,* the pain is generally referred to the navel, tenderness is found localized early, there is a moderate rise of temperature and flatus may pass.

In *peritonitis* there is a history of peptic ulcer or other abdominal disease, the patient is shocked and shows the peritonitis facies. Fever and vomiting are persistent: the latter may subside early and rarely progresses to fecal vomiting: distention and tympany are early signs.

Acute pancreatitis may give the same symptoms as obstruction which is high in the gut, and differentiation may be impossible. However, constipation is less common and the purgative which may have been taken by the patient has been effectual without relief; flatus passes and shock occurs earlier than in obstruction.

In conclusion, the mortality in intestinal obstruction is unnecessarily high because the diagnosis is not made early or medical treatment is carried on too long: the prominent early symptoms are pain, vomiting, constipation and failure to pass flatus. If these are not relieved permanently by lavage and bowel movement, the case becomes surgical and should be operated on at once; fecal vomiting, tympany and toxæmia are advanced or terminal symptoms.

PRESENT STATUS OF POLIOMYELITIS—ITS ETIOLOGY, PATHOLOGY, CLINICAL MANIFESTATIONS AND THE PRESENT METHODS OF DIAGNOSIS AND TREATMENT

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WHILE the last word on poliomyelitis has by no means been said, we have made great advances in its pathology and treatment. In discussing this subject I shall proceed on the theory:

1. That the disease is infectious and to some extent contagious.

2. That it is a pathological and not a clinical entity.

3. That the diagnosis, especially in obscure cases, can be fairly definitely established by the aid of laboratory tests, and

4. That serum treatment holds out a promising future.

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Struempell[1] in 1884, Pierre Marie[2] in 1885, Medin[3] in 1890, Wickman[4] in 1907 and other investigators have established the infectious character of the disease on the ground of its epidemicity and clinical manifestations—acute onset with fever, headaches, gastro-intestinal disturbances, etc. It was the work of Landsteiner and Popper[5] in 1909—the reproduction of the typical clinical and pathological picture of the disease in monkeys by intraperitoneal injections of a suspension of the cord and brain of a child that died of poliomyelitis—that corroborated the earlier theory of the clinicians. With regard to the contagious character of the disease, it may be said that it does not seem highly contagious, since very few cases were reported that contracted the disease while in hospital—notably nurses and other attendants. That two or more members of the same family are attacked by the disease at the same time is no criterion, for in all probability the same source of infection operated in all instances.

The specific germ of this infection has engaged the attention of many investigators both here and abroad with inconclusive results.

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The momentous importance of this chapter of the etiology demands a very thorough discussion in order that we may arrive at a definite understanding of its present status.

Fr. Schulze [6] found in the spinal fluid diplococci similar to the gonococcus arranged in short chains of tetrads, which could not be grown. In another case [7] the same investigator found a diplococcus in the spinal fluid, but advises to suspend judgment, for he was able to demonstrate similar cocci in a case of tuberculous meningitis and also in one of chronic hydrocephalus.

Concetti [8] found in the spinal fluid of ten cases of poliomyelitis and three of polioencephalitis twice the diplococcus lanceolatus, once Weichselbaum's diplococcus intracellularis and six cases were negative.

Dercum [9] found in one case and Looft and Dethloff [10] in two cases Gram-positive diplococci; Engel [11] and Spiller [12] found in the spinal fluid of their cases the staphylococcus albus; Batten [13] found numerous bacteria postmortem; Barnes and Miller [14] found the staphylococcus citreus and albus in the spinal fluid but none on sections.

According to Wickman's report Geirsvold [15] has carefully studied sixteen spinal fluids and blood specimens in which he was able to demonstrate twelve times in cultures and three times microscopically a Gram-positive, ovoid diplococcus and tetracoccus, which was described by Schulze and which grew well on ordinary media. When injected intravenously into mice, rabbits and pigeons this coccus produced paralyses. Geirsvold, however, speaks very cautiously about its significance.

Harbitz and Sheel [16] found Geirsvold's cocci in the fluids of some cases but not in others, and in no instance could they demonstrate any microörganisms on stained sections.

Wickman and Jundel [17] had negative results in cultural and microscopic examinations of the cords in eight cases and of the spinal fluids of six cases.

Allan Starr [18] reports that Wollstein, while working in Flexner's laboratory during the epidemic of 1907, made aërobic and anaërobic cultures from a number of spinal fluids. Fifteen cultures remained sterile, once a staphylococcus grew, once a Gram-positive bacillus and in three instances Gram-positive cocci of Geirsvold's type. Complement fixation experiments with serum, spinal fluids and extracts of various organs proved negative.

Dixon, Fox and Rucker [19] claim to have found in the blood of ten human beings and of ten monkeys ill with poliomyelitis a bacillus 10 microns long and 0.8 micron wide, curved at an angle of 60–75 degrees at one end, occasionally at both ends, the curved end being bulbous. They grew well in ordinary culture media. These bacilli could not be found in filtered virus nor could they be demonstrated on stained smears of cord or brain tissue of infected monkeys or human beings.

Flexner and Nogouchi [20] report the cultivation of a filterable micrococcus 0.15–0.3 micron long and ovoid in shape, cultured from brain and cord tissues anaërobically on Nogouchi's spirochæta medium, which produced in inoculated monkeys the characteristic clinical and pathological picture of poliomyelitis. Dr. Anna Williams told me that she was able to isolate this coccus from two human brains out of 40 cases of poliomyelitis that came to autopsy in the Willard Parker Hospital during the epidemic of 1916. The coccus cultured according to the method of Nogouchi proved, however, non-pathogenic, as it has not produced the disease in any of the inoculated monkeys. In the attempt to obtain this coccus from monkeys that came down with poliomyelitis, and the number exceeded 40, she was unsuccessful in every case.

Nuzum and Herzog,[21] Mathers,[22] and E. C. Rosenow, E. B. Towne and C. W. Wheeler [23] obtained Gram-positive cocci and streptococci, respectively, from brain and cord tissues and spinal fluids of poliomyelitis patients and grew them on ordinary culture media aërobically and anaërobically. They claim to have produced the disease in rabbits and monkeys. I have carefully gone over their published pathological pictures and failed to find in them anything characteristic of poliomyelitis. In this contention I am fully sustained by the investigators of the Rockefeller Institute.

Many investigators, including the writer, have had uniformly negative results with attempts to culture any specific germ from tissues and spinal fluids of human and experimental monkey cases of poliomyelitis.

H. L. Abramson [24] reports that a great number of spinal fluids of typical poliomyelitis cases, some terminating fatally, have been centrifuged and the sediment containing bacteria injected intracerebrally into monkeys and in no instance was poliomyelitis produced. The monkeys remained well.

We must gather from the above that no two investigators demonstrated the same germ and with the exception of Flexner and Nogouchi's experiments not one has produced the characteristic pathological picture of the disease. Flaccid paralyses in lower animals, as is well known, can be produced by almost any germ and even by a change in diet as in the case of the guinea-pig. I am, therefore, compelled to conclude that as long as we have no germ which can be cultivated by everybody alike and demonstrated beyond a peradventure of a doubt to produce the typical clinical picture and pathological lesions of the infection and reproduced from animal to animal and the germs demonstrated on stained sections, we are not justified to accept the discovery of a specific germ causing poliomyelitis.

With respect to the character of the virus, apart from the doubtful cultural results, we know that it is filterable through porcelain filters—and asbestos. This was first shown by Levaditti and Landsteiner [25] and soon after their report also confirmed by Flexner and Lewis and by Leiner and v. Wiesner, who independently came to the same conclusion. It is destroyed when heated to 50° C. for one-half an hour; it withstands refrigeration, drying and glycerin. The virus retains its activity in water and milk after 30 days. One-half to 1 per cent. solutions of menthol, permanganate of potash or peroxide of hydrogen destroys it at once. It is not rendered inactive in a 1 per cent. solution of thymol for one hour or 0.5 per cent. solution of phenol for three days; bile has no effect upon it; it withstands the effect of gastric and intestinal secretions.

The mode of infection is now accepted by all investigators to be by way of the perineural lymph-spaces, the virus finding access through the nasopharyngeal mucosa. This is accomplished through inhalation or contact with articles of diet contaminated with virus. One school, headed by Wickman on the continent and Flexner here, maintains that the disease is communicated by direct contact, making it highly contagious; the other school counting the vast majority of investigators maintains that the infection is indirectly transmitted. Flexner, in an address before the N. Y. Academy of Medicine on July 13, 1916, stated as the hypothesis of direct contact to be sneezing, coughing and kissing. We must accept that such might be the case in some instances, but the experience of every one will certainly refute

this theory that it operates in every instance. That human beings are carriers no one will gainsay, but only in the same manner as other factors through indirect means. Since it has been shown that drying does not destroy the activity of the virus, it is conceivable that the nasal secretions and fæces containing the virus when cast about in a careless manner will become attached in the dry state to living beings or clothing upon men and in this manner carried and disseminated. After it was conclusively shown by me and Thro [26] and fully confirmed by Josefson [27] that the virus exists in a viable state in the dust of the sick room, the above-stated theory assumes a rather convincing character, to say the least. In this way it may be explained how pet animals are transmitting the virus. It is conceivable, then, that flies may carry the dried virus as they do pollen grains and deposit it upon food articles which would infect when coming in contact with the pharyngeal mucosa. Rosenau [28] has produced true poliomyelitis in monkeys by allowing hundreds of flies fed on blood in a cage where monkeys were down with the disease for a week. Frost in one instance was able to corroborate his work. This does not mean that the fly is the host. It was merely a mechanical means of transferring the virus, a vaccination over a long period of time. In Sweden and Norway and Alaska where flies do not exist severe epidemics are recorded. In the epidemics on the continent and in this country no one has, so far as literature shows, noticed the mark of any sting upon a patient as yet. The theory of transmission by the bite of flies can be safely dismissed.

The indirect method would also explain how it comes about that cases appear in isolated places, when we remember that food provisions and merchandise are carried to those isolated places. Either the carriers or the articles are infected with the dried material which comes in contact in some manner with nasopharyngeal mucosa and the damage is done. When one only contemplates the highly organized complexity of society and that no place, strictly speaking, may be called isolated, the infection through indirect method is easily explained.

With respect to its epidemiology one can only theorize, for no satisfactory data are on hand from which deductions could be made with any degree of accuracy. We know, however, that the virus withstands freezing so that it will survive from one season to the other.

Two additional factors possibly operate, namely, many persons become actively immunized during an epidemic and, in all probability, those with a point of minor resistance in their neuraxis and not sufficiently immunized succumb to the infection. It then becomes necessary for another crop of children with a weak spot to be born in order that the disease should again appear. This, I believe, is the rationale of the periodicity of epidemics.

So far as the age is concerned, it is preëminently an infantile disease, 85 per cent. of all cases occurring between the ages of one and four years and 96 per cent. during the first decade, when only the cases with paralysis are considered. If the so-called abortive types should be included as poliomyelitis—and I am not ready to admit the diagnosis as correct in that type without a positive complement fixation-test, of which I shall speak later—of course the age percentage would in all probability be altered. In general, it may be stated that no age is to be excluded. Sex plays no material rôle in this infection.

Poliomyelitis, furthermore, shows very definite seasonal variations in its incidence. The records of epidemics in many countries show that it occurs during the summer months and reaches its maximum in the late summer and early autumn. Sporadic cases occur everywhere throughout the entire year.

The period of incubation is accepted to be from 2 to 30 days. I have a case on record with an incubation period of one day. It was in a physician's child and the father brought the infection after staying in the house of a relative with a poliomyelitis patient for 36 hours. Twenty-four hours after he had arrived home his child, three months old, was stricken with fever, which lasted two days. On the third day the infant's lower extremities became paralyzed.

II

It is universally established that poliomyelitis is an acute infectious disease, that is not limited to the central nervous system but involves all other viscera. The macroscopical and microscopical pathological picture is everywhere the same and for that reason I insist that poliomyelitis is a pathological entity.

The pathological picture of the disease can be best described as that of the three stages.

1. In the prodromal stage certain changes take place which, while

analogous to later changes, differ from them in intensity. It must also be borne in mind that these changes were observed in the experimental animals since human cases never come to autopsy in this stage. As early as the third day after infection we find a hyperæmia of the cord and leptomeninges on the anterior aspect and in the anterior longitudinal fissure and in the intervertebral ganglia, especially marked at the lumbar and cervical enlargements. There is an œdema of the entire cerebrospinal axis and yet no increase of the cerebrospinal fluid. The perivascular lymph-spaces are filled with small mononuclear cells, probably lymphocytes. This first change is one of an interstitial meningitis without any fibrinous deposit or any exudate upon the surface of the meninges. In the intervertebral ganglia, however, there is at this stage a pericellular infiltration of small mononuclears and polymorphonuclear leucocytes. The perivascular lymph-spaces are anatomically continuation processes of the arachnoid spaces so that the lymph within them is in communication with the cerebrospinal fluid. For this reason we find early a lymphocytosis of the fluid. The cells are now preëminently lymphocytes.

2. As the process goes on to, what we may call, the second or acute stage of the disease, which gives rise to definite clinical syndromes, the above-mentioned changes assume more intensive and extensive dimensions and also additional aspects.

Macroscopically viewed the vessels of the cord and brain are very much injected; the entire cerebrospinal axis is œdematous, there is a marked inflammatory reaction in all meninges, especially in those of the cord. The brain and cord on section have a moist, translucent, œdematous appearance, and the gray matter of the cord is swollen so that it projects above the level of the white matter. Frequently small punctate hemorrhages may be discerned by the naked eye. Inflammatory changes, both parenchymatous and interstitial, were also noticed in thoracic and abdominal viscera and also in various glands. The nasopharyngeal mucosa which is accepted as the point of entry of the virus is rather pale pinkish, œdematous, and covered by a frothy serous transudate. I consider this condition of the nasopharyngeal mucosa as pathognomonic quite early in the acute stage. Since the infant swallows the nasopharyngeal discharges and some may enter the bronchi, we can explain the presence of foci of congestion in lungs and alimentary tract. The lymphatics, as I have stated

above, are the primary avenues of the distribution of the virus and the glands, therefore, are congested and œdematous.

Histologically the disease is characterized by a perivascular and interstitial infiltration of round mononuclear, polymorphonuclear, plasma and endothelial cells. This is also true of the lymph-spaces around the ganglion cells of the anterior horns of the cord, the cells of the nuclei of the cranial nerves, the cortical brain cells, basal ganglia cells and those of the cerebellum, also of the cells of the intervertebral ganglia. The infiltration in the cord follows the vessels of the pia of the longitudinal fissure which supply the anterior horns. The vessels of the white matter and the posterior horns do not escape altogether. And thus the pathological picture of the cord is that of a transverse myelitis. In such cases the infiltration may be focal or diffuse throughout. The capillaries of the gray matter are engorged, frequently burst, and give rise to small hemorrhages. Alterations in the peripheral nerves have not been described. There have been cases described in which the cell degeneration was marked, while the perivascular infiltration was scanty. These are exceptions.

As the process goes on we find two types of destructive processes. In one instance the perivascular and interstitial exudate forms a sheath around the vessels for long stretches, pressing on the lumen of the vessels, and thus exerting a mechanical obstruction to circulation and thereby to cell nutrition. To this mechanical obstruction I ascribe the œdema and one phase of cell destruction. Lack of nutrition and accumulation of detritus causes the cell to swell, the Nissl bodies coalesce, the nucleus becomes eccentric, and the cell finally breaks down, becoming autolyzed in its own ferment, there being no antiferment present to counterbalance it.

In the second instance the cell destruction is brought about by the pericellular infiltration of its lymphatic space and cell body with leucocytes, wandering glia cells and polyblasts, the so-called neuronophagocytosis. These cells enter the ganglion cells with the probable purpose of destroying the virus therein. They are seen on section in a degenerated state, caryorrhexia. This is the predominating characteristic form of cell destruction seen in poliomyelitis. Once the cell is destroyed, it is conceivable that later we should find a degeneration of its axones.

3. If the hemorrhages and the exudate become absorbed in time

before the destructive changes are too far gone the cells will eventually recuperate. If, on the other hand, the destructive process is complete, the whole of the gray matter becomes converted into organized connective tissue, the horn, or whatever part of the central nervous system may be involved, shrinks into cicatricial tissue and that is why older writers describe cases of diminished anterior horns found on autopsy in cases surviving the disease with residual paralyses. As end results we must also mention the atrophy of muscles and bones in the paralyzed extremity in cases of flaccid paralyses as a result of destruction of their trophic centres in the gray matter of the cord.

Since the cytology and chemistry of the blood and cerebrospinal fluid is disturbed in the various stages of the disease, only quantitatively and not in quality, we might discuss this pathological phase under one heading.

The data about the blood changes are meagre. Mueller claims to have observed a leucopænia of from 3000 to 5000 cells always present in the acute stage. He bases his report on 15 cases observed. La Fetra [28] reported in six cases a leucocytosis running from 13,400 to 20,600. Peabody, Draper and Douchez [29] report on blood findings in 59 patients as presenting a constant and marked leucocytosis. Gay and Lucas [30] observed in both monkey and men a leucopœnia. The reports of other investigators are just as contradictory and we shall, therefore, desist from further study of this subject.

The spinal fluid has been thoroughly investigated by every worker in poliomyelitis. All agree that there is an abnormal cell content anywhere from 9 to more than a 1000. In most instances the mononuclears constitute 100 per cent. of the cells, while in others polymorphonuclears are in the majority. From reports at hand it is difficult to gather at what stage of the disease the one or the other type predominates. This is also true of the albumin and globulin content and of the sugar-reducing substance in the fluids. There is always an increase of albumin and globulin, but it does not seem to vary with the period or the intensity of the infection. All investigators agree that like in all other inflammatory conditions of the meninges and the cerebrospinal neuraxis the cell increase and the albumen and globulin content are constant accompaniments and that from the cytology and chemistry of a given fluid without any history or clinical findings it would be impossible to make a diagnosis of poliomyelitis. It was nat-

urally felt at all times that in an infectious disease a specific substance ought to be present fixing complement. For, as I shall point out later in the discussion of the differential diagnosis, the diagnosis of poliomyelitis is not such an easy matter in a great variety of cases, especially in times of epidemics. Many investigators attempted to solve this problem without success. It does seem that I have [31] met with some amount of success in complement fixation experiments in the examination of 42 spinal fluids of frank and suspected cases of poliomyelitis. The results show 53.5 per cent. positive reactions, 27.9 per cent. doubtful and 9.5 per cent. negative. As an antigen, use the virus obtained from filtrates of cord and brain suspensions of monkeys that died of poliomyelitis and this is digested with trypsin. Employ the original Wassermann method. I hope that this success will be of a far-reaching importance.

SYMPTOMATOLOGY

Our difficulty lies mainly in the possibility of early diagnosis of the disease before the onset of the paralysis. The importance of this cannot be overestimated, since it may afford us a means of attempting to intercede in time to prevent a paralysis and, possibly, death.

As in the case of every infectious disease so here we have a prodromal stage, the so-called preparalytic stage. In searching, then, for a set of symptoms during this stage that would be pathognomonic of it, we must have recourse to its pathology. Bearing in mind the picture described above, we may expect very early fever as the first sign, accompanied in one-half of the cases by vomiting, with or without diarrhœa. Alongside of this there are, without exception, nasopharyngeal symptoms. Frequently we hear that the patient began to sneeze, or made attempts at sneezing, and at times this was accompanied by copious nasal discharges. Upon inspection we find a somewhat anæmic, glistening, œdematous condition of the nasopharyngeal mucosa. This condition persists for a few weeks after the paralysis has set in and then changes to an anæmic atrophic state. I have [32] described this symptom and laid stress upon it as a pathognomonic sign early in the disease. Regan, who examined a great number of patients during the epidemic of 1916 in New York with respect to this sign, describes in other words something similar. Some writers

describe a ragged and inflamed tonsil in some cases, but fail to state whether that was not preëxistent in the normal state of the patient. Others speak of a normally appearing throat.

Headache and pain ought to be, and as a rule are, constant accompaniments. The little infant cannot tell us of its headache, but he is giddy and drowsy, yet rarely comatose; the mentality is always clear, and the child is easily aroused. The older children always complain of headache and giddiness. The headache is due to the hyperæmia of the brain vessels early in the disease.

It has been shown in experimental and clinical cases that the exudate in the intervertebral ganglia is quite marked early in the disease and associated with this infiltration is a marked inflammation of all the meninges of the cord. For these reasons there is, quite early, pain in the extremities and along the spinal column, a hyperæsthesia along the area analogous to the affected segments of the cord, and rigidity of the muscles of the neck. It should be remembered, however, that there is no pain on pressure along the course of the peripheral nerve trunks, but rather upon extending the affected limb. The children are found with their extremities in a flexed position, and an attempt to extend them, or even slight passive motion, produces excruciating pain—so much so that the patient cries from apprehension when only approached by the physician or nurse. The inflammation, when extending to the meninges of the brain, may give rise to simple twitchings or even convulsions in direct proportion to the extent and intensity of the affection. The patients as a rule favor some extremity in particular, for there is the weak spot, and this favored extremity will become paralyzed. Reflexes in this stage may be exaggerated, weak or even abolished, depending entirely whether the cord alone or the brain be mainly involved. In the case of cord involvement the reflexes will be weak or absent, while in the case of involvement of the brain alone they would be exaggerated.

To recapitulate, then, we meet in the prodromal stage the following constant symptoms: sudden onset with fever, headache, drowsiness, at times twitchings or convulsions, pain in the extremities and back on passive motion, sometimes gastro-intestinal disturbances, the peculiar condition of the nasopharyngeal mucosa and the cytological, chemical and serological alterations of the cerebrospinal fluid. Some

investigators call attention to an early and profuse perspiration, but I cannot verify this in my experience.

In attempting to classify the symptom complexes in the subacute and chronic stages, we must bear in mind that in reality we are dealing not with an anterior poliomyelitis, but with a polioencephalomeningo-myelitis. In this stage we are dealing with the end results of the infection. The symptoms indicate the site or sites of involvement anywhere along the cerebrospinal axis. Some of the prodromal symp-toms may become more accentuated or even disappear, notably fever, headache, drowsiness, and the gastro-intestinal symptoms, if such were present, and often pain also. All symptoms may clear up and the patient fully recover. These are the so-called abortive cases, and in every epidemic many such cases are reported. Most of the others that die or remain alive present several groups of paralyses, such as (1) Cerebral spastic hemiplegias or monoplegias; (2) cranial nerve involvements; (3) spinal flaccid paralyses; (4) pontine and cere-bellar syndromes with tremors, ataxia and speech defects; and (5) mixed types. Of the cranial nerves the facial and acoustic are most frequently involved, the former resulting in Bell's palsy and the latter in deafness. Not infrequently the abducens alone suffers, result-ing in a convergent strabismus of the affected eye. The cerebral type is, comparatively speaking, rare, and it is perfectly clear that if the sensoriomotor area is involved we shall have a spastic hemiplegia with convulsive seizures following, the Jacksonian type of epilepsy. In the purely spinal type which is most prevalent we have, of course, the flaccid paralysis of one or more extremities, according to which segments are affected. Here the cell of the motor neuron in the an-terior horn becomes destroyed, its neuraxon degenerates, causing a break in the spinal reflex arc, giving us a flaccid paralysis, loss of reflex, wasting of muscle group innervated by these fibres, loss of response to the faradic current and a positive reaction of degeneration. These flaccid paralyses frequently result in spinal curvatures and also in ab-dominal and diaphragmatic hernias on account of lack of proper muscu-lar support. The mixed types are those of bulbospinal or cerebrospinal symptom complexes. It seems to me that such classification reconciles the chief clinical symptoms with localization of the predominant ana-tomical lesions. Thus poliomyelitis is not a clinical entity.

III

It is quite obvious that it requires no diagnostic acumen to recognize poliomyelitis when with all the previously enumerated symptoms after the prodromal stage a flaccid paralysis appears in one or more extremities. We cannot be certain in the preparalytic stage, nor are we at all positive in abortive types that we have dealt with poliomyelitis, and especially is this true in the spastic hemiplegias and other cerebral types. In cases of cranial nerve involvement and also in peripheral nerve affections with no other manifestations after a febrile illness, it is by no means fair to call the case one of poliomyelitis. I have seen two cases sent in as postdiphtheritic paralysis which turned out to be poliomyelitis of the bulbar type. Several cases of measles and scarlet fever turned out to be poliomyelitis. One case of spastic hemiplegia in a girl of ten years of age was sent in as poliomyelitis which turned out to be brain syphilis, and this was also the case in a child with double ocular ptosis. A young man of nineteen years of age, sent in as poliomyelitis on account of a flaccid paraplegia, turned out to be syringomyelia. And this was in all probability the experience of other investigators. In the complement fixation test with the specific antigen, as described before, there seems to lie the missing link in the chain of tests. I warn that I do not intend to say that this is the only test, but with clinical signs of a rather doubtful nature this test should clear up any doubt. Rosenow's and Nuzum's so-called agglutination tests cannot be accepted at their face value for the reason that as yet we cannot accept their streptococcus as the specific germ of the disease.

Since different sites of the cerebrospinal axis may be affected and various symptom complexes may arise, it would be an idle task to enumerate the various diseases of the central nervous system as differentiated from poliomyelitis. It would suffice to say that given the symptoms of a febrile reaction and a pathological cytology and chemical alteration of the spinal fluid, the complement fixation with the specific antigen ought to enable us to establish a fairly exact diagnosis.

IV

Since the disease is contagious and is disseminated by healthy as well as by sick carriers, prophylactic measures are essential. A strict quarantine for a number of weeks is, of course, the first pre-

requisite. As it has been shown that the virus is found in dust of the sick room in a viable condition and that it survives in milk and water for a period of thirty days, it is imperative that the floors should be thoroughly and frequently scrubbed, bedpans and urinals washed with antiseptic solutions, permanganate of potash preferably, and the bedclothes and linens used by the patients thoroughly boiled. Foods, where possible, should be boiled. Frequent flushing of the streets, and especially of the sidewalks, is a measure par excellence, as people spit on the sidewalks and children play there. On general principles I advocate the extermination of insects as possible carriers of the disease. Domesticated animals and household pets should receive frequent washings. Bathing in stagnant water in an infected neighborhood, the playing of children around sand-heaps in parks and their congregation in playgrounds or in places of amusement during an epidemic should be prohibited. Since it was shown that the virus is readily destroyed in weak solutions of hydrogen peroxide and menthol, I strongly advise that the nasopharynx of the sick be frequently sprayed with a one per cent. solution of peroxide of hydrogen and that of the healthy individuals with a one per cent. solution of menthol in liquid petrolatum. As a measure of individual prophylaxis, this has given me good results in my practice. Specific prevention, such as vaccination, would be ideal, but as yet nothing has been accomplished along this line.

During the febrile stage complete rest is essential and should be continued as long as there is pain, for every movement causes discomfort. The patient should be handled with extreme gentleness and one should even forego sponging in high fever in order not to cause pain by such manipulation. Bromides and chloral are, as a rule, efficient in alleviating pain in infants, but in older children and adults the opiates or coal-tar preparations will have to be resorted to in extreme cases. An exclusively fluid diet and mild catharsis, when necessary, should be carefully maintained. A cold compress to the head with a temperature higher than 102 proves soothing.

Of specific medication urotropin was advocated by Flexner and his coworkers on the ground that it decomposes into formaldehyde on alkaline membranes, but it has not proved of particular value. Meltzer recommended intraspinous injections of a solution of adrenalin chloride, claiming that it reduces œdema, and this remedy also

proved without value. Netter [33] has attempted to treat his patients with the serum of recovered patients who suffered from poliomyelitis and he reported success in 22 cases. Since then this was extensively tried in this country with some success. It is administered intra-spinously in intervals of 24 hours in doses of 10 to 20 c.c. The workers of the Rockefeller Institute prefer to combine the intra-spinous with intravenous injections so as to administer a larger quantity and also to combat a possible constitutional infection. This seems to me a rational method since poliomyelitis, as already pointed out, is a general systemic infection. There are, however, two short-comings that cannot be overcome with this therapeutic agent. In the first place we can never obtain a sufficient quantity of serum of recently convalescing cases and serum of old cases has very little specific substances and, therefore, not potent enough. And then again it is impracticable to standardize this serum, as it would require two monkeys for each test, a rather expensive procedure.

I [34] have succeeded in obtaining a very potent horse serum in the Research Laboratories of the New York City Department of Health and will quote verbatim the summary of my report: "All neutraliza-tion experiments were positive without exception. The serum pro-tected one monkey against a rather slowly acting virus, of the eighth generation, originally recovered from a human patient." The serum was used with marked success in three human cases. In order, how-ever, to judge the efficacy of this serum in human cases it should be used first of all in at least 25 very severe cases of poliomyelitis in which the diagnosis is beyond a peradventure of doubt, for the mild cases as a rule recover without any treatment whatever. And for this reason we cannot accept the serum produced by Rosenow and Nuzum.[34] They produced a streptococcus serum and cured mild and abor-tive cases in which the very diagnosis of poliomyelitis was not at all established.

Judging from results obtained with serum treatment in other in-fectious diseases, I am inclined to be optimistic as to efficacy of the specific serum in the treatment of poliomyelitis.

Since the after-treatment of poliomyelitis, after paralysis, remains permanent, does not enter into discussion here and is purely a matter of orthopædic surgery, I will say in closing that we have good reason to hope for complete success of the ultimate isolation of the causative

agent and that we are near the realization of a specific prophylactic and curative agent for poliomyelitis.

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NOTES ON A CASE OF DIBOTHRIOCEPHALUS LATUS; DIAGNOSIS AND TREATMENT

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TAPEWORMS are found in human beings of all ages but are frequently overlooked. Evidences of their presence are usually manifested by symptoms resembling other conditions. In this section of the country cases are so rare that we often give tapeworms the least thought. The following case from the Service of Professor S. Solis-Cohen, Philadelphia Hospital, presents a striking example of the possibility of an improper diagnosis:

O. L., born in Finland; carpenter by trade, forty-one years of age. The patient is a white male adult, about 5 feet 7 inches in height, weighing 110 pounds. He is anæmic and cachectic in appearance, fully conscious, and has some scars all over the body. Not a very satisfactory history is obtainable since the patient cannot comprehend or speak English with any degree of efficiency. He has been in this country six years and his family history is negative. He lost 60 pounds in weight in the past five months.

Examination.—His head is slightly bald; has dark brown hair. The temporal arteries are tortuous and sclerosed. The conjunctivæ are pale; the pupils react equally to light and accommodation. The nose and ears are negative. The teeth are poor and the breath fetid. Evidences of pyorrhœa alveolaris are present. The tongue is coated and atonic. The posterior pillars are hyperæmic, and the tonsils are somewhat enlarged. The intercostal spaces are prominent and atrophy of the pectoral muscles is in evidence. The apex beat is in the normal location and no cardiac anomalies are present. The lungs are clear. The abdomen shows no anomalies, but the man complains of tenderness and pain on pressure in the epigastric area.

We gave him the Ewald test meal, but under no circumstances were we able to pass the stomach-tube, due to his marked asthenia and nervous phenomena. The fact of the rigidity, tenderness, and

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inability to pass the tube impressed us with the possibility of the presence of an obstruction due to malignancy. Three X-ray, and as many fluoroscopic examinations, were made with negative findings. The urine was examined several times with negative results. On December 3, 1918, the examination of the blood rendered the following:

Red blood cells 4,100,000
White blood cells 7,700
Hæmoglobin .... 60 per cent.

Differential ....
{
Eosinophiles ...... 60 per cent.
Endothelial .... 1 per cent.
Lymphocytes ...... 3 per cent.
Pollys. .... 62 per cent.
}

The two following blood examinations show quite a different picture from the one above:

February 7, 1919.............
{
Red blood cells...... 2,870,000
White blood cells.... 8,600
}

February 9, 1919.............
{
Red blood cells...... 2,328,000
White blood cells.... 11,200
}

After exhausting every means capable of leading us in the right direction toward a proper diagnosis, our Resident, Dr. Amelia T. Wood, suggested the possibility of a parasite infection. As previously stated, the patient was born in Finland, and on close questioning we learned that he had spent several years as a fisherman. Had we been more careful with the history in the first place we would without doubt have thought of parasitic infection at the time.

On February 10 the man was given 3 ounces of mag. sulph. After several evacuations he was given 15 grains of thymol, which was repeated in 15 minutes until four doses were taken. The next day the dibothriocephalus latus, about eight feet long, was expelled. Four days later his bowels were again thoroughly cleansed, and at the suggestion of Professor Cohen, he was given a dose of Pelletierine tannate, but with no results. Following this he was given full diet, and was placed on a combination of arsenic, iron, and strychnine. The patient gained in weight very rapidly—about 7 pounds a week. The anæmic appearance was rapidly disappearing, and he showed marked improvement in strength. Repeated blood examinations showed a continuous increase in the red blood-cells and hæmoglobin.

The last examination, made on April 26, 1919, showed the blood findings to be practically normal.

This case deserves consideration, not only from the diagnostic standpoint, but also from the fact of its rarity in the United States. We could have been easily misled, and labelled the case one of malignancy because of the presence of secondary anæmia and the prominent gastric symptoms, particularly when for some reason we were unable to pass the stomach-tube.   On the other hand, gastric ulcer may have been suspected not only from the gastric disturbance, but also on the ground that occult blood was found in the fæces on two occasions. While this is not a pathognomonic sign of ulcer, it is nevertheless a frequent one.   Several students remarked that this case should be thought of as one of pernicious anæmia.   The absence of megaloblasts and of a leucopenia, is sufficient reason to discard pernicious anæmia.

TREATMENT OF "VINCENT'S ANGINA" BY INTRAVENOUS INJECTIONS OF SALVARSAN: REPORT OF THREE CASES

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Louisville, Kentucky

WHILE various types of stomatitis were clinically recognized and described by ancient medical writers, the specific ulcero-membranous form of the malady is of comparatively recent discovery. Vincent, in 1896, first noted and described the constant association of fusiform bacilli and spirochætes in both superficial and deep ulcerative mouth and throat lesions, and his writings popularized the designation " Vincent's angina." When and by whom the word " angina " was first used in connection with stomatitis seems uncertain. It " is merely a descriptive and qualifying term which can be only correctly employed symptomatically; and in that restricted sense it may be applied to any pathology having as a characteristic concomitant or complicating feature a sensation of strangling, suffocation, or spasmodic choking. The phenomenon has been observed as an accompanying symptom of numerous acute and chronic affections, neoplastic formations, etc., involving the mouth, throat, the intra-thoracic and even the upper intra-abdominal viscera," but has rarely been noted in Vincent's disease.

So-called *Angina Vincenti* is essentially an infectious or contagious disorder which may primarily or secondarily attack any portion of the bronchial, laryngeal, pharyngeal, tonsillar, palatine, lingual, gingival or buccal mucosa. However, the usual site of beginning inflammation and ulceration is the tonsillar tissue. In type the disease may vary from slight to severe; it may result fatally within a few days, or terminate in complete recovery; it may persist days, weeks or months.

It is an interesting observation that the pathogenicity of Vincent's organisms remains unconfirmed according to the postulate of Koch, and some writers even claim that the fusiform bacilli and spirochætes are inhabitants of the normal buccal cavity and throat. However,

from the constant symbiotic association of these organisms in smears from the mouth and throat lesions it seems almost certain they represent the true etiologic factors.   Among the predisposing causes which contribute to production of the disease may be mentioned : Insanitary surroundings and unhygienic modes of life; general and local affections which contribute to reduction in individual vital resistance, such as measles, pertussis, scarlatina, diphtheria, tuberculosis, typhoid fevel, syphilis, scurvy, tonsillitis, pharyngitis, laryngitis, bronchitis, mercurial stomatitis, ulitis, alveolar abscess, dental caries, etc. Richardson believes the " Vincent " organisms unlikely to produce the disease unless the teeth, buccal mucosa or tonsils are already unhealthy, or the physical status of the individual is decidedly below par.   Taylor and McKinstry found the fuso-spirilliform organisms in a total of three hundred cases of ulcero-membranous stomatitis which they examined.

Vincent's original classification has been quite generally accepted by more recent writers, according to which the cases may be divided into two groups, and in either group the disease may run its course within a few days, or persist for weeks.

(1) The superficial, pseudomembranous or diphtheroid form, in which a thin grayish-white film usually begins on one tonsil and gradually extends over a wide area.   As a rule the membrane is easily removed (though not *en masse*), leaving a red bleeding base and a shallow ulceration.   There is generally an associated diffuse pharyngitis accompanying this type.

(2) The ulcerative, and more common form, in which there is deep tissue necrosis covered by a thick (creamy) yellowish or grayish exudate which is likewise easily removed and also leaves a raw granular bleeding base.   This leads to the formation of crater-like ulcers with irregular somewhat indurated and undermined edges. Both forms show a tendency to be unilateral.   The cases reported herein conform to the foregoing classification, one and three being of the ulcerated form, and number two the superficial.

The malady has also been classified clinically as acute and chronic, the former being generally confined to the tonsillar tissues, the latter extending to other structures.   Another clinical division is: primary, when involving only the tonsil, and secondary, when extension occurs to adjacent structures.

CASE I.—A. J. M., male, aged eighteen years, general physical status good, was referred to me by Dr. C. H. Harris, of Louisville, with a diagnosis of Vincent's angina. Fusiform bacilli and spirochætes were present in smears from the ulcerated throat lesions. Wassermann reaction negative.

Upon examination the mouth was found clean and healthy in appearance as far backward as the tonsils. On posterior pillars of the tonsils, especially the right, there were ulcerated areas, "punched out" and ragged, which bled freely on slight manipulation. The uvula was two-thirds destroyed and the process had extended upward partially over the soft palate, deep ragged ulcers being present. Aside from pain on deglutition the patient complained of nothing, and there were no abnormal subjective symptoms. The clinical appearance was strikingly like that of tertiary syphilis.

The patient was given 4 grams of salvarsan intravenously, and within two days improvement was marked. One week after the first injection the throat had become entirely clear excepting slight inflammation of the soft palate. He was then given 5 grams salvarsan and instructed to report one week later for inspection. When examined it was found both tonsils had become acutely inflamed, appearing, the patient stated, within the last twenty-four hours. No fusiform bacilli were found in smears. Another full dose of salvarsan was given, and the patient had no further trouble.

CASE II.—M. R., female, aged six years, was referred to me by Doctor Dean. Wassermann reaction negative. Bacilli fusiformi and spirochætes were found in smears taken from the tonsils. Diagnosis Vincent's angina. The tonsils and posterior pillars were inflamed with scattered areas of superficial ulceration extending to the uvula and posterior arch of soft palate.

The patient was given 2 grams salvarsan intravenously and two days later the pathology had practically disappeared. On the eighth day 1.5 grams salvarsan administered to insure lasting effect. The patient has since shown no sign of recurrence.

In neither of these cases was there any fever or acceleration of the pulse-rate. The girl had no discomfort beyond slight pain on swallowing; the boy suffered considerable pain even on taking liquids. The appearance of the girl's throat resembled diphtheria, while that of the boy was similar to the lesions of tertiary lues.

CASE III.—L. H., negress, aged forty-two years, was admitted to the Louisville Public Hospital at eleven o'clock A.M. July 5, 1919, and the following report of the case, prepared by the interne, Dr. Robert F. Braunlin, is interpolated almost in its entirety:

Family History.—Father dead, "heart trouble"; mother dead, cause unknown; three sisters, three brothers and husband living and well. The patient has borne no children. No history of purpuric attacks in other members of the family.

Personal History.—Patient had ordinary diseases of infancy and childhood; pneumonia when twelve years old. Menstruation began at sixteen, periods regular until age of thirty-eight, but irregular since then, duration five to six days. For the last eleven years had uterine fibroma which was surgically removed five weeks ago. Menstruated last time four months ago.

Present Illness.—On July 1st the patient noticed slight mouth bleeding, and soreness began July 2d. Looking in mirror she saw a small black bleeding point on inner side of right cheek; there was but little soreness at that time. The teeth became loose within a short time; had no teeth extracted; took no poison; had no trauma; knows of no causative agency.

Physical Examination.—Pulse rapid (130) and weak. *Head:* eyes negative except for anæmic palpebral conjunctiva. *Scalp:* areas of apolecia over temporal and parietal regions. *Nose:* clotted blood particles around nasal orifices; seems to be a "crusting" further upward in nasal cavity. *Teeth:* negative. *Tongue:* negative on dorsum.

Patient expectorating much bright red fluid and clotted blood. On right side of palate posteriorly, and on entire inner surface of right cheek and over anterior and posterior pillars and tonsils, there is a thick greenish-gray, very adherent and dense necrotic crust or exudate at whose boundaries the adjacent mucosa shows inflammation, injection, and bleeds readily. The patient's breath is exceedingly foul and offensive. At other places in the mouth, especially where left cheek and lips are in contact with teeth, there are similar (though smaller) areas of involvement. The post-pharyngeal wall also shows some small areas of disease, and beginning involvement is noted beneath tip of tongue at frenum. The mucous membranes are decid-

edly anæmic. Induration can readily be detected by palpating outer surface of right cheek.

Thorax: Lungs, negative; heart-beat rapid and forceful, all sounds accentuated—"sharp and snappy." First heart sound increased in intensity, being many times louder than second sound over both mitral and tricuspid areas. *Abdomen:* surgical dressing intact and not disturbed. *Extremities:* apparently negative, no subcutaneous hemorrhages.

On admission the buccal cavity was cleansed with liquor antisepticus, then silver nitrate fifteen per cent. solution in tincture of iodine and distilled water used as a mouth wash and gargle. This was followed by tincture of myrrh and boric acid (alcoholic solution), equal parts. Horse serum injection: 10 c.c. at five o'clock P.M. July 5, and 10 c.c. at eight A.M. July 6. Internally, fifteen grains cancium lactate every four hours; liquid diet; sulphate of strychnine one-thirtieth grain t.i.d. On July 7 A.M. the following gargle was substituted: liquor antisepticus alkalinus, with equal parts of glycerine and distilled water.

On the afternoon of July 7 Dr. William J. Young and Dr. Stuart Graves were called in consultation. Doctor Young suggested the possibility of Vincent's angina; swab and cultures made. The disease had then progressed considerably, having involved the inner lip surfaces extensively, and being pronounced in mouth floor at frenum. Laboratory reports, July 7. Wassermann negative. Swab: staphylococcus, streptococcus, and Gram-negative bacilli. Swab: fairly numerous spirochætes and large bacilli, some fusiform in shape; neither organism typically like that of Vincent's angina. Impression: Vincent's angina and secondary anæmia.

Death occurred July 8 at 2.30 A.M. Conjunctiva very pale; "patient seems to have been bled out." (R. F. Braunlin.)

As stated in the interne's report, I saw this patient at the hospital late in the afternoon of July 7, 1919, and made the diagnosis of Vincent's angina. It was by far the most rapidly destructive process I have ever seen. The floor of the patient's mouth was a necrotic mass which reminded one of advanced carcinoma. The gums about the teeth were so extensively diseased and necrotic that pieces could be removed with slight traction,

After making an examination arrangements were made to administer salvarsan the following morning. Dr. Stuart Graves saw the patient with me and took several smears from the buccal lesions. I believe now that a mistake was made in not giving salvarsan immediately, and also in not realizing the rapidity with which the system was being overwhelmed. Of course, just what effect salvarsan might have had under the circumstances is a question; but having in mind the rapid disappearance of the lesions in case number one, I believe it would have given the patient a possible chance.

As the circulatory system distributes salvarsan administered intravenously, a better chance is afforded for the lesions to be affected in a uniform manner; and the likelihood of recurrence is also lessened. On the other hand, if, as in syphilis, antibodies are produced which destroy the invading organisms, the intravenous route is certainly a more efficacious, safer and more rapid means of accomplishing the desired result. Even in the superficial type I believe intravenous administration of salvarsan superior to local applications. The danger attending intravenous injection of salvarsan in small doses is so slight as to be practically a negligible quantity, and its administration is so simple that after seeing the rapidity of the invasion in the third case I would feel far safer giving it in this manner. I am quite well aware that the consensus of opinion seems to be in favor of local application, and I have seen superficial excoriations and ulcerations of the buccal cavity disappear under the use of a ten per cent. solution of salvarsan in glycerine applied three times a day. In case number one, and certainly in cases such as number three, where there is deep ulceration, the wiser plan would seem to be intravenous administration of salvarsan, there being no chance of areas escaping as in local applications, and a definite amount of salvarsan is introduced into the system.

A point of particular interest to me is the dose of salvarsan necessary to affect this disease. From the limited number of cases seen I believe a half-dose or even less sufficient to arrest and cure the disease. This would render the intravenous treatment fraught with less danger and certainly more advantageous in the deeply ulcerated type. I hope at a later date to report the effect of small doses of salvarsan given intravenously.

CONCLUSIONS

(1) That in Vincent's angina salvarsan is the best means of combating the disease.

(2) That the disease may be more definitely reached and controlled by intravenous injection than by local application of salvarsan.

(3) That the arrest and cure of the disease may be accomplished by small doses of salvarsan intravenously administered, thus making the procedure practically devoid of danger.

Neurology

TICS AND OTHER PATHOLOGICAL MOTOR HABITS IN CHILDREN

By DR. AUGUST STRAUCH

Gentlemen: This evening we shall occupy ourselves with the demonstration and discussion of peculiar motor manifestations that are frequently met with in childhood; they are purposeless, automatic, pathological movements or acts and may upon superficial observation often resemble "bad habits," for which they indeed are often taken by the laity. To what extent this viewpoint is correct or incorrect, will become evident during our discussion. These movements may be rapid, quasi convulsive, or in other instances, more or less slow, complex or rhythmical, and resemble acts of volition. They are known under the terminology of tics, convulsive tics, coördinated tics, tic-habits, habit-spasms and stereotypias.

Instead of making here a futile attempt at an exact definition of these categories and terms I shall give you a general outline and report, demonstrate and discuss concrete cases.

Tic convulsive has been described as a convulsive twitch, a momentary movement, a clonic muscular contraction that occurs as a rule of an identical character habitually in the same individual. The contraction is commonly localized, that means limited to a muscle or a small physiological muscle group; or it may affect a number of muscles as a multiple tic, or more or less the entire musculature of the body in the form of "generalized tic convulsive," these forms merging one with the other.

Among the localized and the least complex tics the most common are those in the region of the facial nerve, the mimic tics, as, for instance, the clonic spasm of the orbicularis palpebrarum (blinking- or nicitation-tic) or the momentary frowning, the raising of the brows, twitches around the angle of the mouth or the nose. They may be

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combined, so that more or less extensive clonic contortions and grimaces result. An innervation of a longer duration will produce a tonic tic, which is less frequent. Either associated with a mimic tic or isolated various other muscle groups may be involved, as seen in the sudden shaking, rotating movements of the head, its tossing backward, with the result of impetuous, violent movements of negation, affirmation or salutation (nodding—tossing tics).

In addition to this list there exist numberless varieties of tics, which is comprehended if we consider the numberless possible combinations of the coördinate conscious as well as subconscious movements of our daily life, all of which may be portrayed by tics. The terminology covers a number of these possibilities, speaking, for instance, of a sucking tic, licking tic, sniffing tic, spitting tic, etc., the meaning of these terms being self-explanatory. In licking tic of children we not infrequently see an eczema around the mouth as a consequence of the permanent wetting; it may by itching and the sensation of tension aggravate the desire of licking, thus creating a vicious circle. Sniffing tic has been described by Meige as " a puckering of the nostrils to the more or less noisy accompaniment of a nasal in- or expiration, associated usually with curling of the upper lip."

Other tics are the jerking movements of the shoulders, of arms or legs, grasping, hopping, stamping and other peculiar movements of every conceivable variety.

CASE I.—No doubt a number of cases of " nervous cough " find here their correct classification. I know a gentleman forty-six years old, otherwise perfectly healthy, who from his early childhood following measles suffers from this " cough tic." Almost ceaselessly once or twice per minute there would occur a single muffled very short cough impulse, a little explosive loud expiration without expectoration and without organic necessity, much to the annoyance of his office co-workers. During sleep this useless cough never appears. Various treatments by throat specialists, including an amputation of the uvula, failed to have any 'influence. It is noteworthy that the patient's father had likewise suffered from an identical " nervous cough " from his early childhood until his death at the age of seventy-five.

Tic movements of the legs are less frequent and rarely isolated, the common form being the so-called " kicking tic." The leg is forcibly kicked forward or sideward or backward, or one foot is knocked

against the other, or the knees are rubbed against one another. In some instances a tic during walking will manifest itself by the patient placing the hollow behind the one knee upon the knee-cap of the other leg, thus necessitating an interruption of the ambulatory rhythm, as I have seen; or by performing a genuflexion or by some other bizarre motor performance, as I shall illustrate later when describing a case.

Case II.—An example of an isolated tic of the legs I observed in a six-year-old girl of healthy, not neurotic, parentage. Without apparent cause the child began " to twitch with her legs." Alternately or synchronously, when standing, she would habitually slightly flex the knee-joints and then suddenly and forcibly extend them, so that the whole body would receive a jerk. These movements would occur with short interruption in quick succession in " spells " lasting from 10 to 15 minutes, at frequent intervals during the day. The girl was poorly developed but otherwise healthy and of good intelligence. The disturbance lasted three weeks and subsided upon the admonitions of her parents. Most probably the girl at first accidentally had executed these movements and indulged repeatedly in them as a kind of sport, until it became habitual and involuntary and she " could not help doing this."

Case III.—A " tic of walking," extremely embarrassing and annoying to the sufferer, I observed in a very intelligent boy, who at the age of nine years had had an isolated blinking tic for a short time. At twelve years of age, following chorea minor, there developed a " kicking tic." During walking very frequently the right or left lower extremity was abruptly and violently flexed in the knee-joint, usually only once, without interrupting the ambulatory rhythm. He obtained a certain gratification by the forcible impact of the muscles of the calf on those of the thigh. However, not infrequently a succession of two or three or more such impetuous flexions, thus interrupting the ambulatory rhythm, were necessary to give the desired relief, that is so characteristic of tic movements. The condition caused him to be ridiculed and lasted with aggravations and remissions for several months. The boy suffered later from migraine with scotoma scintillans, from tossing of the head backwards, blinking and " eyeball tic " (rolling of the bulbus), the latter also with closed lids, especially before falling asleep. Occasionally when walking he must " knock the

knees " or hit the left heel with the right foot, though for the most part he is now able to bridle these impulses. He also suffered for some time from a tonic tic, namely, from frequent attacks of a simultaneous contraction of all the muscles of his right shoulder joint, causing a fixation of this joint for a few seconds. The same took place frequently in the right elbow-joint. For quite a while he also was afflicted with moderate stuttering and hasty speech (*tumultus sermonis,* spluttering). It is noteworthy that for a time he was the subject of a propensity towards imperative smiling at the most inopportune times, even on solemn occasions; this caused him much embarrassment and dismay in anticipation of such situations. All these various accessory symptoms emphasize the basic neuropsychopathia of the boy, the etiology of which, however, remained unknown.

The generalized tic, termed also Maladie des Tics convulsifs of G. Guinon and Gilles de la Tourette, as a rule develops from the localized form. Involving at first principally the mimic muscles, it spreads to neck, extremities and trunk, manifesting a great variety of more or less violent contortions, malapropos gestures and movements that to a great extent imitate movements of expression or reflexes. They are systematized, automatically repeated movements. In addition to that the participation of the articular, phonatory and respiratory apparatus may manifest itself in impulsive utterances of inarticulate sounds, as in a clucking or smacking sound, or in the imitation of animal voices, especially of barking, or in the emission of senseless and obscene words (Coprolalia). Occasionally there exists a morbid impulse to mimic words that have been heard (Echolalia) or to imitate movements and actions of others (Echokinesis). Coprolalia is merely an extension of the vocal tics. The compulsion to stereotyped motor repetitions has its analogon in the psychic sphere. Not infrequently the tic patients suffer from imperative conceptions and actions, as counting the windows, the steps, etc., or the imperative psychic disturbance may assume the form of an abnormal inclination to incessant senseless questionings (Fragesucht) or of a pathological impulse to collect all sorts of useless objects (Sammelsucht). At any rate, there exist close relations between obsessions and tics, and Janet classifies the latter as agitations motrices systematisées.

Bresler reports a man twenty-four years old who, suffering from Maladie des Tics convulsifs, had stereotyped impulses of smashing

windows; whereas in the ordinary cases, the impulsive acts are of an innocent nature, as mentioned before.

CASE IV.—An example of a very complex and extended tic with imperative ideas and acts may be reported here. The nine-year-old boy M. had suffered since three years from various tic movements, changing in their localization and character from time to time; " he acquired new habits every few months." The malady began with grimacing; later he began to toss the head to the right or left, stretched the chin forward and upward; eventually he would frequently stop walking suddenly in the street or at home, in order to stoop forward and tap the ground two or three times in quick succession with the finger-tips of both hands. On account of this queer habit he was nick-named " Johnny pick-it-up." He would also suddenly interrupt his play or writing in order to tap the table with his finger-tips rapidly two or three times. For some time he used to abruptly step to a piece of furniture, stoop over and touch it with his teeth for a second. At another period he would turn his head to the left and lick the shoulder of his coat for a second or so, which often was to be found completely soaked. Or he would pull the left part of the collar of his coat with the right hand to his mouth and lick thereon. Since a few months he has the habit, during his work or play, at frequent intervals of clapping the hands a few times, first behind his back and immediately thereafter in front. He also would bring toys with a brisk movement to his mouth and touch them with his teeth for an instant. Since a few weeks following scarlatina he suffers from violent facial tics; also the chin is pushed upward and forward spasmodically, and the neck thus stretched. Saliva is swallowed forcibly and with loud noise (deglutition tic) so that the speech is thereby interrupted. There are also attacks of aerophagia and eructation and " spells " that resemble semi-voluntary laryngospasm; inspiration becomes difficult and is accompanied by a stridor, by "choking" and futile inspiratory movements. Not only during these attacks but also more or less isolated does the diaphragm participate in the manifestations of the tic disease, contracting spasmodically for a few seconds and pushing the abdomen out. Sometimes, especially in the evening, he has the sensation of " funny feeling " in the abdomen, causing him fear and crying. These obscure anxiety states may be in connection with aerophagia, but no definite opinion can be given. For a year or so he has the

habit, before falling asleep, of uttering incessantly hem, hem, so as to annoy the rest of the household. He sleeps, however, soundly, is a very intelligent, good pupil, but very nervous and irritable; he has daily headaches.

It is noteworthy that his uncle and father suffer from sniffing tic, the latter also from a tic that consists in rather vehement circular friction tours executed in a stereotyped way with the left hand around the nasal region. No doubt the strange actions of the boy have the character of an obsession; they are imperative acts. This is the more evident since the boy shows a marked inclination to imperative queries (Fragesucht) and a pathological tendency to collect valueless objects (Sammelsucht), features that are especially in children the forms of imperative conceptions and acts.

The single acts in the attacks of aerophagia and eructations in our cases are so continual that concurring in the views of Meige we may consider them as tic (" aerophagic tic "), or at least, closely akin to it. When seeing the boy again a few weeks ago, most of the bizarre disturbances had subsided.

Case V.—As an illustration of Maladie des Tics convulsifs with participation of speech in the clinical picture of imperative processes, namely with coprolalia, I wish to demonstrate the following case: The boy, E. S., eleven years old, was admitted to the Cook County Hospital only a few days ago. According to the mother's statement, he shows since four years irregular twitchings in the face, and since a later time also in arms, ceasing, however, during sleep. The conditions became lately worse, the twitches involving gradually the entire body. A month ago he began to use every little while during the whole day foul speech, uttering with low whispering voice a vulgar slang word, signifying the act of coitus. This lasted for more than three weeks, when it eventually had disappeared, having been " stopped by punishment," as the mother said. The boy is very irritable, unruly, disobedient, and easily aroused to outbursts of violence. He is mentally below par.

A few minutes' observation reveals to you a number of various tics. With only short intervals between, there follow in irregular succession or in combinations rapid contractions of the orbicularis palpebrarum, a sudden opening of the mouth, a drawing down of its corners, licking of the upper lip, violent protrusion and retraction of the tongue, a

snout-like momentary projection of the mouth. Now the head is tossed in a violent jerk sideward, then impetuously rotated as in negation once or twice in succession, then again tossed posteriorly two or three times. The upper extremities also participate in the tempestuous tic movements, best described as catching or chasing a fly away, throwing a ball, grabbing the nose, pushing something aside, or as movements that resemble an awkward military salute. Now he rubs rapidly his abdomen with his left hand, then waves with the same hand, makes a brisk movement as if chasing a fly from the face. After a little pause the head is abruptly inclined sidewards, the face rubbed against the shoulder and the shoulders shrugged. Whilst he lies in bed, both legs with extended knee-joints are suddenly lifted up and the body thereby is thrown forward as if by an electric shock. When seated on a chair, you see him making a stamping movement with the left foot, then abruptly hopping up or jerking with the whole body as if startled. These movements succeed each other in the most irregular manner but repeat themselves in the same identical form. Notwithstanding the intensity and extent of the disturbance the patient, contrary to the behavior in chorea minor, shows no muscular hypotonia and is able upon command to be completely still for a short while and to execute slow gymnastic movements in an almost perfect manner without interfering tics. He also is able to write fairly well and without any jerk. Movements of chorea minor differ from those in our case also by their greater variety and by being more slow, not coördinate and not grouped physiologically. There are periods of exacerbations and remissions and at present there are no impulses to utter obscene words. A few months after leaving the hospital a great improvement had taken place and the boy was able to attend a school for backward children.

CASE VI.—As an example, illustrative of a tic that involved the phonetic apparatus as a predominant feature in the clinical picture, I recall to your mind the eight-year-old girl, H. F., that was demonstrated here some time ago. For fifteen months previous to her admission to this hospital the girl had manifested facial tics of moderate degree. Seven months after the beginning and following a severe psychic trauma, namely the witnessing of eclampsia attacks in her mother during parturition, the facial contortions became aggravated and the tic spread gradually, though only for a short time, to the entire

body. At the same time the child began to utter some sound, at first with muffled voice, that soon grew louder and more frequent during the daytime. Her sleep was undisturbed by these vocal manifestations. When demonstrated she showed in addition to tossing of the head, snapping movements of the mouth and abrupt snapping of the teeth, a striking vocal tic: a very loud exclamation of a short, abrupt, high-pitched A; whereby the mouth was widely and spasmodically opened, the head as a rule tossed backward or rotated violently and the entire body shaken. Occasionally when the mouth remained closed, the exclamation was a muffled high-pitched *hm, hm.* This vocal tic would occur within a minute once, or several times in close succession, and pause for one to three minutes (during periods of exacerbation), to be repeated *ad infinitum.* During isolation no perceptible improvement took place. Unfortunately the child was taken home after a few days and had escaped farther observation. In this case we notice the aggravating effect of a psychic trauma upon a previously moderate and localized tic and possibly the relation of terror to the genesis of the vocal tic. We may regard the latter a continuation, aggravation and automatization of the instinctive interjection of terror and fright. Thus we may consider it in our case as being in line with the conception of tics as automatized psychic defensive movements, namely a motor reaction upon an originally psychic perturbation (Bresler) or as " coördinating memory convulsions (Erinnerungskrämpfe, Friedreich). The futility of our suggestive and persuasive treatment, during and by the isolation, strongly militated against the assumption of the vocal symptom being of hysterical nature.

CASE VII.—In the cases so far discussed the muscular contractions as true tics occurred spontaneously without particular external provocation. In the following case a peculiar motor habit manifested itself for a long time only under certain circumstances. The girl, B., at the period of weaning from the breast at the age of ten months, when feeding time approached, would loudly and incessantly smack with the tongue, until food was administered. The mother, when later making her purchases in food stores, took her child along and bought her regularly a sweet piece. Soon the child had developed the habit to give a veritable exhibition of loud smacking, whenever entering or passing a food store. Eventually, even the aspect of food adver-

tisements as, for instance, on the cover of a magazine lying on the table of my office, at once provoked incessant smacking. At present, at the age of seventeen months, this habit occurs sometimes also without recognizable provocations. Since a few days, when dyspepsia set in, she will, whenever there is a possibility, put her finger in and incessantly bore into the umbilicus, without demonstrable cause. The genesis of the phonetic peculiarity is evident and renders it obvious as an associative motor memory process; it is an automatized psycho-motor process of the nature of a conditional reflex, perhaps a tic in *statu nascendi.* The dependency of this vocal habit on external conditions is analogous to that in Case IV.

NATURE AND PATHOGENESIS OF TICS

Though tic convulsif is a movement of a clonic, sometimes a tonic type, yet it is far from being a true spasm or convulsion, as Meige and Feindel have sharply discerned. Tics are less than a spasm. Their origin is psychic, cortical though no anatomic basis has yet been established. Charcot says tic is a maladie psychique. Different from real spasm, they have the semblance of reflectoric or expressive or defensive movements, they are systematic and coördinate. Tics particularly of minor degree are often mistaken for bad habits, a construction not entirely void of some truth. They originate often from movements that at first had been conscious, purposive or appropriate and reactive, but became gradually by repetition automatic, habitual and irresistible. Only to a certain degree are they subject to the will and may be repressed for a short while, though creating then a feeling of discomfort, tension and suffering, even sometimes anguish, demanding relief obtainable only by yielding to this tic impulse. Therefore, tics are more than a mere habit. In fact, the mental suffering caused by a short voluntary suppression may reach a degree that the patient will thereafter succumb to a veritable orgy of tic movements, an explosion of the pent-up motor forces.

As illustratives of the psycho-mechanism of the development of a tic, I mention here a few much-quoted examples: A foreign body, or an acute conjunctivitis, causes a reflectoric spastic blinking, a blepharospasm or blepharoclonus. If, after the removal of the cause, the blinking persists, it has no more objective purpose, it becomes a tic convulsive. Or a child has an acute coryza. The disagreeable sensation

of the accumulation of the secretion causes sniffing to remove the secretion. If, after the disappearance of the affection, the sniffing persists, it has no more any objective purpose and becomes a sniffing tic, though it may be impossible to decide with exactness when this transformation of a merely reflectoric act to a pathological tic takes place. Or a rough, stiff and tight collar may scratch the neck. The finger is logically run along the inside to give at least momentary relief. In the normal person with the removal of the cause also the effect will disappear, as a now unnecessary act. In some individuals, however, this act will persistently be repeated as a habit; in fact, it may be an obsession that causes nervous discomfort if resisted, and relief, if yielded to.

Such tics are the fixation of an originally purposive movement or of a normal motor reaction to some disagreeable sensation. They are illogical and "absurd" only because they occur without adequate external, detectable provocation and without farther objective purpose. Tic is the motor gratification of a coercive desire, the motor expression of an imperative propensity. The troublesome feature is the imperative irresistibility of the repetitions. A tic does not as a rule affect voluntary movements. In quiet and under mental diversion, as a rule, though not always, it will lessen or entirely cease; whilst, on the other hand, excitement, fatigue and the consciousness of being observed may aggravate it, similar to stuttering and other impulse neuroses.

It is a physiological fact that frequently repeated movements and acts become unconscious and automatic, due to the facilitation of the nerve elements concerned. Upon this fact rests education and the acquisition of skill; it also explains our personal characteristics of movements, expressions, etc., to a great extent. But it is the neuropathic basis with its feebleness of inhibitory power that is held responsible for the abnormal readiness and persistency of the automatization of certain muscular acts. The neuropaths are hypersensitive to impressions, unstable, and more readily translate a sensation into motion. " Their sensory-mechanism is too glib and they lack in instinctive as well as voluntary inhibition, else they would not tic " (H. T. Patrick). Of course, not every motor habit is a tic. A number of tics result from imitation, so strongly developed in children who would imitate especially the strange and peculiar. In many instances, however, the

genesis remains unknown, no pathological or painful process provocative of a reflex motor action being demonstrable in the child; the tic simply coming into being. The original and stimulating cause was perhaps so insignificant that it escaped the observation of others. No doubt unwise parents and improper rearing conditions are often responsible for a tic or other troublesome habits being allowed to develop. Tics are frequent among children of neuropathic parents, especially of those that themselves had been, or still are, affected by this malady. In the latter case the factor of neuropathic taint concurs with the element of imitation. In one of my observations the mother, two aunts and one uncle of a " ticing " boy were affected with tics when young, and in another instance two sisters, one brother, both parents and one uncle of a " ticing " girl suffered from tics and stereotypies.

In some instances a physical, or rather psychic, trauma, as fright, etc., or some infectious disease, has been followed soon by a tic; or the latter has been aggravated, possibly by a further injury to the basic neuropathia, or by provoking a strong reactive movement, as instanced in Cases IV and V.

The neuropathic nature of ticqueurs in childhood may betray itself by precipitate or spluttering speech or stuttering, by functional disturbances of bladder and by psychic characteristics, as inattention at school, excitability of temperament, maldevelopment and feebleness of will, and thus deficient progress in school in spite of good intellect. The psychic stigmata often found in the adult ticqueurs, their instability, often bizarre character, significant of psychic infantilism have been emphasized by Meige and others. They often belong to the group of superior degenerates.

STEREOTYPIES

In addition to the rapid tics convulsives and related to them, we meet in children pathological motor habits that entirely lack the convulsive character, the so-called stereotypies. The various authors circumscribe and apply the term not uniformly.

Cahen defines stereotypies as non-convulsive coördinated attitudes or movements that resemble intentional or professional acts, are repeated at frequent intervals and always in the same fashion, till their conscious and voluntary performance is replaced by a degree of un- and subconscious automatism by the long duration and the repetition.

They have been studied with great care by Cahen and others, especially in the mental defectives, where they occur frequently. They represent here endless varieties and peculiarities. They occur, however, also among healthy individuals, though in less striking forms. The question arising is, whether these stereotypies are always the expression of psychic instability and lessened inhibitory power or not. No doubt many habitual movements, unnecessary and superfluous, returning in a stereotyped, identical fashion, such as gestures of predilection and individual mannerisms and other automatic habit complexes, occurring in the normal individual may depend to a certain degree on the environment, education and imitation.

As in other functional disturbances we find also in the field of automatisms the transition from the normal to the abnormal to be a gradual one, no sharp line of demarcation existing between mere habits, stereotypies and true tics convulsives, there existing every intermediate variety of automotisms.

In close connection with these stereotypies, if not identical, are certain automatic habits in children, issuing from some impulse, their acts repeating themselves always in the same fashion. They have, like the true tics convulsives, their origin in the same psychomechanism of automatization of frequently repeated motor complexes. Among the most common forms, occurring also in children without degenerative character, is the habit of finger-sucking, nail-biting, plucking the skin of the fingers and biting of lips (cheilophagia). Bordering on the physiologic we meet, especially frequently, the habit of finger-sucking. As is well known, sucking is a most primal reflex act, a very prompt, easily provoked reaction upon the touch of the mouth, at first unconditional, becoming later conditional, that is, depending upon hunger, until it gradually disappears altogether. Thus the habit in the newborn and infant may originate from accidentally thrusting the finger into the mouth. In a certain age the instinct of the babies to bring everything to the lips naturally promotes the habit of sucking foreign bodies, as a rubber nipple; or otherwise, the finger, or in absence of this, the own lips or the own tongue. No wonder these habits are so common. Also mothers sometimes put the thumb of the baby into its mouth to quiet it. Lindner gave us an excellent monograph on " Ludeln," or the sucking habit, with pictorial demonstrations of its many varieties, as lip-, finger-, arm-,

tongue-, toe-sucking, etc. According to his view every child has a predisposition to "ludeln," which under certain conditions may develop into a veritable "suctus voluptabilis."

Frequent as it is in infancy, as a rule it disappears at latest in school age; but under certain circumstances it may assume a rather morbid aspect as a neuropathic manifestation ("sucking tic"), become irresistible and persist into later childhood. Thus we see, how under certain circumstances the bridge is soon thrown across the vague demarcation of the " physiologic " and the conditions insensibly pass into the field of the pathologic. If of long duration, it will disfigure the nails and even the end phalanges.

These injuries are even more marked in nail-biting (onychophagia), a few remarks on which may not be amiss. It is classified by Meige and Feindel as a biting tic and is of the same pathogenic nature. Though it may in milder degree occur among healthy children, it becomes in the nervous an irresistible habit, and is considered a psycho-neuropathic manifestation that not infrequently is carried beyond childhood into adulthood. It is indeed frequently associated with other signs of a neuropathic constitution or degeneracy, such as impulsive tendencies, bed-wetting, night terror, somnambulism, sleeptalking, with great timidity and states of anxiety, unfounded fear of the physician or the inability to remain still. The restless child must ever do something with the hands, it will pick or bite the lips, etc.

Another form of muscular habits among the stereotypies is the twisting, pulling and jerking out the hair (Trichotillomania, Trichomania).

A case (Case VII) of plucking and twisting the hair in a marked degree is the following observation: Girl, K., three and a half years old, very timid and nervous. When still an infant she began during the act of thumb-sucking to twist and pull the hair of the right temple, and she indulged in this habit to a degree that the hair was there broken off and very sparse. At the age of about five, when her interest in play had grown, she gradually had abandoned this habit and indulged in it only when brought to bed or left alone without occupation.

A special discussion deserves those movements that follow each other in a rhythmical succession (Rhythmies of the French). Common are the rhythmic head rolling, the pagode-like nodding of the head,

the swaying of the trunk anteriorly and posteriorly or to the right
and left alternately and the rolling of the trunk from side to side
with or without the extremities and trunk maintaining a preferred,
stereotyped attitude.   These rhythmies are apparently accompanied
by a sensation of comfort and pleasure.   It is this often accentuated
sensation, manifested also in other stereotypies, for instance, in the
finger-sucking, that has induced some authors to presume a connection
with acts of masturbation of infants and young children.   The prog-
nosis in intelligent children is good.

CASE VIII.—As an example of a very conspicuous and rather
frequent stereotypie of the trunk, I wish to report the following
observation: The girl, L. S., of healthy parentage, from about the
beginning of her second year of life, used, when sitting in her bed,
to sway the trunk almost continuously during the day forward and
backward, holding, if possible, the railing firmly with both hands and
often thereby shaking the bed.   The habit was so incessantly indulged
in, that certain muscles showed hypertrophy from overactivity.   The
girl seemed to enjoy this rhythmic exercise; there was not the slightest
indication of a sexual factor.   Neither had this condition anything
to do with epilepsia nutans.   After about seven months the habit of
the intelligent and otherwise perfectly healthy baby had passed
away spontaneously.

CASE IX ("Court Case").—An example of rhythmical head-
rolling in association with other stereotypies is the six-months-old
girl, M. L., admitted to the Cook County Hospital without history.
She is poorly nourished and has rhachitis of minor degree.   She
manifests the following peculiarities: Lying in bed awake and con-
tented she would rotate the head from side to side with large ampli-
tudes; simultaneously the trunk participates slightly in the rolling
movements.   The right forefinger is kept in the mouth and the left
arm extended in a stereotyped manner and held up into the air,
apparently to augment the momentum of the rolling.   At other times
both index fingers are kept in the mouth during the rolling perform-
ance.   These rhythmical movements are performed continuously from
between six to seventy times and have as a rule a frequency of ninety
to ninety-five, sometimes only of sixty to seventy times per minute.
Synchronous with each movement a loud inspiration and expiration
is audible.   The series of movements are interrupted by motionless

periods of one to two minutes' duration. The hair of the occiput is entirely worn off. When distracted or when knowing herself closely observed, the child retards or entirely ceases the acts. Often when interrupting the rolling, she will take up another motor performance in a stereotyped fashion and with apparent satisfaction; in quick uninterrupted succession she will strike the left knee four to forty-five times very violently with the heel of the right foot, whose toes sometimes are flexed in a claw-like manner. After finishing this performance she would renew her habitual rolling. The child is intelligent, good-natured, of happy disposition and gives evidence of enjoying her habits. There was never nystagmus to be observed. Occasionally, also, during her superficial sleep is the head-rolling to be observed. These conditions have nothing to do with spasmus nutans, upon whose etiology Raudnitz has thrown a light in his valuable contribution.

CASE X.—Some of our head-rollers preferred a certain position in the wake state. Thus a baby, nine months old, will, whenever possible, turn on the stomach and then indulge in rhythmical anterioposterior movements of the head. This nodding occurs even when blindfolded and during sleep. Sometimes the child rotates the trunk together with the head to and fro in large amplitudes, whilst lying on the right side and forming a *marked opisthotonus* with extreme retraction of the head, and the legs bent *ad maximum* at the knees. It is this *extreme opisthotonic attitude* the baby maintains commonly, also when being still.

Brisk tics of the convulsive type are hardly to be observed in the very young whose active movements normally are slow and clumsy. It seems natural that in infancy there exist only the simpler forms of automatisms as the various "rhythmies" and the habit of fingersucking and not those tics that occur later in childhood and imitate the more complex, later acquired and farther differentiated movements that require a certain development of the brain. The children affected with head-rolling are mostly poorly nourished. (It is possible that the uncertainty in balancing the head or trunk at this period of life predisposes to the development of the above stereotyped rhythmical movements. The tic-like localized convulsions or twitches in infants, we sometimes observe as symptomatic of Jacksonian epilepsy and the manifestations of *epilepsia nutans* in infancy or later are

of entirely different nature and do not belong to the automatisms in discussion.

A brief mention is required by certain motor phenomena considered of neuropathic nature that occur during sleep in the form of compulsory automatic movements of the head, mostly of rhythmical character. Oppenheim described and designated them as sleep tics, and Swoboda and Zappert reported a number of observations under the term of *jactatio capitis nocturna,* classifying them as stereotypies. Tics in the adult pause during sleep or appear not until toward morning, the sleep abolishing the manifestations of these motility neuroses. In children, however, the greater cerebral excitability may, if coëxisting with a neuropathic predisposition, render possible an automatism also during the sleep, certain motor centres continuing their function, where they should be at rest.

Case XI.—These sleep stereotypies consist as a rule in rhythmic rotating or nodding movements of the head, rotations and swaying of the trunk, as demonstrated in Case X. In another of my observations concerning a fourteen-year-old boy, the nocturnal jactations of the head were so violent and the chin in these rotations thrown against the left shoulder so forcibly, that the bed shook and members of the family often were aroused from their sleep. On the left lower jaw a red bruised spot gave evidence of the impact. When spoken to reprimandingly during his sleep, he immediately would stop the head-rolling for a while without awakening. This habit had existed since his early childhood and disappeared not until he had entered a military academy at the age of sixteen—most probably from embarrassment and shame. According to his confession this performance aided him in falling asleep. His father, a very enterprising and active industrial man, when young, had the same disturbance, as likewise the older brother of the patient.

STEREOTYPED ATTITUDES

Case XII.—Not infrequently do we see in children stereotypies not only of movements but also of attitudes, as shown before. An example of the latter, of however inconspicuous character and combined with stereotyped movements, I am about to demonstrate. A twenty-two-months-old girl, V. Th., who was admitted to the hospital a few days ago, has had for at least two months the habit of holding

the upper extremities in a peculiar attitude. Both arms are flexed at the elbow-joints, the hands with the forefingers extended and pointing up- and forward, whilst the other fingers are flexed. She slowly pronates and supinates the arms in succession for a number of times, desisting for a short while and recommencing *ad infinitum*. At times the one forefinger will be thrust into the mouth. When lying down the legs are almost constantly maintained in flexion of the hip-joints and the knees, though there is normal muscular power.

CASE XIII.—A boy of five and a half years, two years ago, had for a period of seven months the habit of keeping the right forefinger stretched, imitating his father, whose forefinger is ankylotic in extended position from an old panaritium. Insignificant as this curious feature, manifesting a great tendency toward mimicry, may seem at first, it gained in importance by the subsequent, not merely accidental, blinking, sniffing and spitting tics of a rather marked degree. The licking of the lips caused an eczema.

STEREOTYPIES IN IMBECILITY AND PSYCHOSES

It is especially within the province of mental deficiency that stereotypies of all sorts occur frequently, such as pagode-like swaying movements of the trunk forward and backward or sideward, or rotating of the trunk in a monotonous manner, lasting perhaps for hours; or peculiar movements of the upper extremities, as beating with arms and hands, rhythmic knocking or tapping movements of the hands and fingers, movements as if playing piano, rubbing of the palms, picking, clapping, etc. Such idiots have been named idiots automatiques. Clapping the hands was a very frequent phenomenon in addition to periodical mumbling in a case of progressive *dementia paralytica* in a thirteen-year-old girl, C. H., demonstrated to you in this hospital some time ago.

Among the stereotyped movements of the lower extremities of imbeciles may be mentioned the pendulous movements of the freely hanging legs. These various movements are purposeless and may be combined; generally they are very monotonous, and repeated over and over again in a more or less rhythmic succession. Athetosis and choreatic movements in cerebral affections, as in infantile cerebral paralysis, do not belong to this class as being due to, and symptomatic of, anatomical lesions.

Stereotypies of attitude among the imbeciles are less frequent and occur mostly in combination with those of movements, such as striking and conspicuous positions of head or trunk or extremities. Commonly, they are in the same way as stereotypies of movements readily interrupted by a mere touch and word spoken to the child.

CASE XIV.—S. R., one and a half years old, was brought to the hospital on account of convulsions and coughing. He is a well-nourished epileptic imbecile who manifests a number of stereotypies. Lying in bed on the back he will roll the head rhythmically, then thrust four fingers of the left hand, whilst holding it with the right hand, into the mouth and suck. He will also rub the thorax with both hands, moving them rhythmically up and down several times, then rotate one or both legs to and fro for a while or beat his left shoulder rhythmically with his left hand, or make waving movements with both hands over his chest. Then again he will, aiding with his right leg that is flexed at the knee, roll the entire body continually to and fro and repeat all these stereotypies in various successions, but ever in the same fashion. When still, he will draw both legs high up and bring the *plantæ pedis* in contact with each other over his chest or neck and persist in this attitude. He also utters frequently an inarticulate harsh palatal noise and grinds the teeth.

Stereotyped positions during sleep are enjoyed even by the healthy, the one child preferring this, the other that attitude, as I have dwelt upon in one of my former articles. A very striking sleeping attitude is met with among Mongolian idiots; they often will coil themselves up in bed so that the feet will almost touch the head.

Imbeciles also often show phonetic and vocal manifestations, as repeated snorting or crowing or exclaiming ba-ba, good-good, etc. If touched or spoken to the child will interrupt these utterances. Even complicated acts with a considerable amplitude, in frequently repeated and systematized way, are to be encountered among idiots. Many have the peculiar impulses to turn around and around, to tread on the same spot, to walk in a circle, to climb upon any object, upon furniture and even high trees without difficulty. Such observations of " climbing tics " have been emphasized by those who looked upon some forms of microcephalic idiocy as a manifestation of atavism, namely of a former developmental stage of the human race (Affenmenschen). This instinctive inclination to purposeless repetitions of the same

expression of will may manifest itself also in the untiring running forward and backward and in a uniform expression of speech.

We also see in *dementia præcox* a marked tendency toward stereotyped attitudes and movements. The patient may kneel or stand on the same place for hours, sit on the ground, lie in the most uncomfortable position in bed for a long time or clinch the hand spasmodically to a degree of persistency that pressure necrosis may ensue. Manifold are the stereotypies of movements, especially in the states of catatonic excitement. There are repeated gestures and actions, the habit to touch certain parts of the body, pacing to and fro, promenading untiringly in the same corner, buttoning and unbuttoning the clothes, making bread pills incessantly, rolling objects between the fingers, beating the plate with the spoon, playing the same strain on the piano and other peculiarities, familiar to the psychiatrist.

Also the trend of thought of the patient may disclose signs of stereotypism, namely a persistency of certain conceptions and ideas, as expressed in stereotyped, uniform, over and over again repeated words, phrases and sentences (stereotypism of speech).

In a certain way akin to the ticqueurs are those children who suffer from a general motor restlessness, who cannot sit still or hold the extremities quiet for a moment, who, in short, have fidgety nervous natures to a marked degree, are " like quicksilver." Even allowing for the great agility, liveliness and impulsiveness of this age, these children display an intense mental and emotional activity and their psychic processes are transformed too readily into motor impulses due to the feebleness of the inhibitory power. Their nervous restlessness is characterized often by a sudden change from activity to fatigue and exhaustion.

PROGNOSIS AND THERAPY

The prognosis of tics in children is not unfavorable, provided early treatment takes place and a more marked and serious psychopathic constitution or mental deficiency is absent. Many tics of children are of ephemeral nature and disappear spontaneously, and judicious diversion and correction by proper education, discipline and mental growth may easily break the habit in its initial stage. It may often prove sufficient to draw the child's attention to the impropriety of a bad "habit" in order to stop it, where there is not yet a real

pathological condition. If the malady is inveterate, of long duration and a deeply rooted " second nature " therapeutic results are difficult or impossible to obtain, and the affection may be a veritable affliction throughout the life of the victim.

The treatment has two aims. It must be directed against the neuropathia and the special motor symptom. The general somatic conditions have a decided influence upon the tic disease, may aggravate or ameliorate them; therefore invigorating and hygienic measures should be employed, embracing good sleep, salubrious country life or at least outdoor life, avoidance of fatigue, excitement, mental overburdening and school worry, though in milder cases school attendance may be beneficial through its discipline.

The principles of the special motor treatment are simple, but their successful application requires intelligence and coöperation, not only of the patient, but also on the part of the parents. The tic movements, and later the motor tendencies, themselves must be brought under the conscious control of the will power and the involuntary motions turned into voluntary ones. Thus the tic habits are reduced and retraced to their original nature of conscious motions by this retrograde pedagogic process. Under proper supervision daily exercises in the inhibition and suppression of " motor discharges " must be executed. The patient must learn how to resist the motor impulses at first consciously to preserve absolute immobility, " as if for a photograph "; in the beginning for a few seconds, later longer. Immediately following this discipline of inhibition slow active gymnastics are to be executed, first simple ones, later more complicated ones, especially of those parts that are involved in the tic disease. Fatigue, however, must be avoided. French authors recommend also the use of a mirror as helpful for the ticqueur in observing the correctness or inaccuracy of his movements, gestures and attitudes and the perfection of his immobility. In order to obtain the indispensable coöperation of the patient in these gymnastics of inhibition, he must be encouraged to continue his efforts. His self-confidence must be nurtured by emphasizing the progressive improvement, how little it may be in the beginning. This psycho-motor training finds its place also in the hyper-kinesis of nervous fidgety children.

The psycho-motor therapy will of course fail of its object through the inability of the attending persons to coöperate in the methodical

re-education. Removal from the family will then be the indispensable prerequisite of therapy. Isolation will at the same time exclude the many sources of irritation and excitement of the home life. In the lighter forms of " twitching," that border still on the line of the pathologic, it is paramount that these movements should be corrected in time by simple pedagogy, the child being admonished, before these nascent " nervous " habits degenerate into real compulsive movements. Conscious and unconscious will and self-control must be developed.

Mechanical devices have also been employed to prevent the automatisms, for instance, orthopædic apparatus, casts, elastic rubber bandages, etc. Against head-rolling, sandbags placed to the sides of the head may serve to give fixation. To overcome the attitude of extreme opisthotonus in Case X, I recommended an orthopædic reclination bed of plaster-of-Paris which also prevented the stereotyped movements.

Medication is little to be depended upon; it will find its place only exceptionally, as, for instance, bromides, chloral-hydrate, codein, etc., during extreme restlessness.

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Pædiatrics

MAY POTENTIAL INSANITY BE RECOGNIZED IN CHILDHOOD?

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It has tritely been said that " the present and the future are dictated by the past." The truth of this assertion is nowhere more marked than in the substantial and material foundation of life—our homes. It is there that a child is first taught the rudiments of civilization that may steadfastly serve him in the future adaptation to customs and conventions of society. The growth and development of every individual and of mankind in general is an uphill struggle strewn with pitfalls and difficulties that must be frankly and squarely met. This march of mankind up the hill of life is made to the accompaniment of the melody of idealism. To some this accompaniment is never heard, to others it is so faint as to resemble only a discord, and to still others it is a clear and distinct harmony. Happily the majority of these footsteps are properly kept atune, for man is, after all, an idealist. But with all of man's idealism, there is associated a certain practicability that tends to eliminate difficulties and pitfalls, thus enabling the bulk of mankind to live and realize more and more, from generation to generation, the ideals of society and civilization. Disease among mankind renders the harmony uncertain in this upward climb, and so man has endeavored from time to time to eliminate pestilence that falters the steps and throws the procession into confusion; but with the elimination of even all physical disease, there still remains a group of persons who climb the hill of progress with steps atuned to discord. These are the mentally disordered and unhappily their numbers are by no means small.

Some idea of the number of mentally diseased persons may be gathered from the fact that there are in the United States more than 200,000 insane under treatment in public institutions. Each year

about 30,000 new cases are admitted to these hospitals, of which 15,000 become chronic cases, that require continued hospital care. Of every ten patients admitted to public hospitals for insane two recover and have no more attacks, three have other attacks, two of whom die insane.   Five of the original ten do not recover but die insane.   Studies conducted in the British Isles have demonstrated that five in every 1000 of the general population are mentally defective, a mental condition that has existed from birth or an early age period, rendering the individual unable to attend to his own affairs with judgment and ordinary prudence.   In this country the U. S. Public Health Service has demonstrated that at least four in every 1000 of the general population are mentally defective.   On this basis, there are at least 400,000 such cases in the United States.   Because persons suffering from mental disease cannot conduct themselves as the standards of the community require many of them become dependent or find their way into prisons, reformatories, jails, workhouses or almshouses.   This has been demonstrated time upon time and illustrates the relationship that exists between the problem of mental diseases on the one hand and dependency and crime on the other.

It may be of interest to know that the expense to the public for the care of the insane alone exceeds all other public expenditure, except that for public education.   The average annual cost for the care of such cases in a public institution is about $200 per patient, which, in the aggregate, amounts to an annual expense of $40,000,000 that must be met from the current revenue of the states.   In addition to the actual cost, one must bear in mind the economic loss to the commonwealth through the withdrawal from productive labor of so many people in the prime of life.   Some idea may be gathered of this loss by the immense number of mentally disordered persons that have been discharged from the military forces.   Thus it is definitely known that more than 75,000 persons suffering from mental and nervous disorders were found unsuited for duty in the military establishments of the United States Government.   Again, one must bear in mind the personal suffering and unhappiness, the social and family disasters and the business troubles they cause, together with the loss of efficiency, failure to meet difficult situations in life that are characteristics of even mild types of mental disease.   Anyone who is familiar

with the abnormalities of conduct associated with mental disorders, knows that murders, suicides, marriage troubles and many misdemeanors are dependent upon mental disorders or mental defects. A population suffering from physical diseases means misery, poverty, decay and inefficiency, whereas a population blighted with mental diseases means, in addition thereto, dependency and disregard for the customs, laws and conventions of society. The problem of the control and prevention of mental disease is therefore of no little importance.

An attempt to enlighten the general public in respect of the preventability of mental disorders should make it very clear that insanity is not a single disease, and that the legal term " insane " is applied to a number of individuals who are unable to adapt themselves to more or less complex social conditions.

For purpose of classification " the insane " may be divided into two large groups:

(a) Those whose mental disorder is due to structural changes in the brain substance or to an intoxication.

(b) Those which are primarily the result of faulty mental equipment accentuated by faulty mental adjustment and faulty habits of thought and conduct which have become so ingrained as to be constitutionally a part of the mental make-up.

In this article we shall confine ourselves to the second group and describe a common type of personality which, when not recognized and not aided in its social adjustment, follows the path that may eventually lead to the State Hospital for the Insane.

In the type of personality under consideration, recent studies have shown that certain constitutional traits of character have long been present in the individual and have operated in the genesis of his disease. This is especially true of one type of mental disorder that is essentially a chronic one and constitutes the majority of mental diseases within all state hospitals for the insane. It is estimated that from 15 to 20 per cent. of the cases admitted to these institutions belong to this type. Because of its long course and infrequent recoveries, the disease is sometimes spoken of as a malignant one. Moreover, because it shows a predisposition to attack individuals during the early years of adolescence, it has been given the name *dementia præcox.*

Inheritance no doubt plays some part in interfering with the proper development of these individuals, but exactly how it operates, is not at present clearly understood. The inheritance of mental traits is not as definite as the inheritance of eye color, stature or other physical attributes. Regardless of the influence of heredity, the fact remains that training will do much to mould a personality into desirable or undesirable social form.

SOCIAL TRAITS

Generally the traits of character that operate in the evolution of dementia præcox are early shown in the life of the individual. During childhood they are not boisterous, vivacious, impulsive or inquisitive like normal children, but instead show a passive resistance to situations and conditions about them. In other words, they appear unable to assert their rights in the usual way or to firmly establish themselves in a natural relationship to their fellows. They do not play freely with other children, but leave them and go off alone, sometimes without apparent reason, but usually upon the slightest provocation. For this reason they are not liked by other children who are quick to appreciate those barriers that a child, or even an adult for that matter, throws up about himself. In consequence such a personality is left alone and his reticence and seclusive tendencies are thereby encouraged.

As such children grow older they usually become suspicious, unduly sensitive and the seclusive traits that were shown at an early age period become exaggerated, thus allowing an opportunity for introspection. Often strong emotional reactions characterize their behavior, such as fleeting but deep depressions, headaches and irritability. As adolescence is approached they may become intensely interested in religion that is not the result of environmental conditions or influences.

INTELLIGENCE

In school, as a rule, they do average work and are far from being stupid. Some of them excel in school work and are apt to spend most of their time in reading and studying to the exclusion of a healthy interest in the play and pleasures of other children. This endless reading and studying of children is a receptive situation that does not call for great demands on the part of individuals, but as they

grow older they shrink from the responsibilities of the world when they must use their acquired knowledge to fulfil the demand of social adaptation. For example, they must be urged to accept positions offered them and, when they do, are fault-finding, brood over imagined difficulties as to what might have been than from the realities of life.

EMPLOYMENT

Such individuals are prone to give up their work and cannot plan for themselves, a method of striving for an ideal. They are not infrequently committed to routine and perform simple tasks by rote with satisfaction to their employer. When they give up their positions they are often restless and dissatisfied but most usually idle away their time. Some of them become endless readers and display interest in the so-called mysteries, such as philosophy, alchemy and astrology. Occasionally one will become a devout follower of a group of social agitators. On the whole, these shut-in personalities show a lack of healthy adaptation to reality and throughout their childhood generally give no worry to parents or teachers. The significance of these traits of character, however, should be more generally known. Although all persons showing them do not become insane, they nevertheless do not have the comforts and satisfaction that go with good bodily and mental health.

LOVE LIFE

However, in the study of mental disorders that have shown personal traits like those described above, there has been observed in both men and women an unnatural attitude towards persons of the opposite sex. They are shy, bashful and ill at ease when in their presence and show a decided lack of development of the social instinct. Among women engagement, marriage and childbirth appear to bear a definite relation to their mental breakdown, and in men there is a decided shrinking from marriage. An illustration is afforded in the case of an insane man thirty-one years of age.

A TYPICAL CASE HISTORY

Information about his mental characteristics was obtained from his mother, two brothers, a cousin and a young woman who was well acquainted with the family. This information, supplemented by that

obtained from him, justified forming a fairly accurate opinion about his personality. The various informants agree that the patient was always peculiar. Even when a boy he was more quiet than others, did not play with other boys but spent most of his time at home. The cousin spoke of him as a "mamma's boy," and the brother also mentioned his pronounced tendency to stay with his mother rather than to associate with outsiders. According to the patient's own statement, he preferred during his school years to associate with a grocery clerk ten years his senior rather than play with the boys. His inclination to make friends outside of the home was evidently quite limited. It was also stated that at home he often stayed by himself. Later in life he began to drink, which was a compromise for his lack of normal social development.

So far as his intellectual capacity was concerned he was said to have been rather poor in school. But when he began work he did very well, and finally took up the carpet-laying trade. At this he was considered a good workman. Although intellectually not definitely inferior, his personality was that of a marked shut-in type.

Moreover, he stated that as a boy he never paid attention to girls and was always shy when about them. During his life he was twice thrown with girls, and called on one fairly frequently for three years, and on another now and then. When the first girl began to talk of marriage, he said, he became disgusted, and henceforth saw her only at long intervals. He claimed never to have loved a girl, and of this he said, " I never knew what that was." He also called on another girl, who, according to her own statement, made some advances to him for a time. Her description of the man is interesting. She said he was quite bashful and when he called came only after dark for fear he would meet people. She stated further that, although she took the initiative, he was too shy, never really made love to her, was not at all like other men she knew, and was " more like a girl than a man." When she spoke to him about marriage, he told her she had " better get someone else." She finally paid no attention to him, though she was a friend of the family, and later visited him at the hospital for the insane. The brother said that the first girl wrote endearing letters to the patient about which the brother teased him. The patient destroyed these, saying that all girls were alike and that they all wanted a husband. This is the extent of his attempts at

love, if they can be called so. It should be added, however, that according to his own statement he always thought he would marry the first girl when he would be through with his apprenticeship and become established in life. He, of course, rationalized his lack of a desire to get married by his financial situation, and added that he could not marry so long as his mother lived, as he had to support her. This is not in accordance with facts.

Four years before his admission to a hospital for the insane, having had various positions up to that time, he settled down to a definite trade and began to learn carpet-laying. It has been stated above that he was efficient in this and it may be added that his position was kept open for him. But it was quite evident that when he took this position a change came over him. In the first place, his cousin stated spontaneously that he became more reticent. Finally, the patient himself gave clear evidence that at the time when he took up his definite trade, mild mental symptoms began, which fact was unknown to his family. He began to think that the men in the shop were talking about him. He thought they wanted to get rid of him so as to get his job. He told them about it, but they only laughed. Then he also heard voices calling him " rummy," " we will fix him," " your work is no good," but he did not react to these voices in any special way. It is not clear during which period of the four years this commenced, but it is evident that it was before the final mental breakdown.

Gradually the time approached when he was supposed to finish his apprenticeship; in other words, the period when, as he stated, he thought he would marry the girl. About that time, which was two weeks before admission to a hospital for the insane, he went into a saloon to drink with some fellows and after a few drinks felt queer and then got what he called unconscious and felt " dopey." How he acted is unknown. The brother said he was very quiet when he came home and immediately went to bed. The patient said that during the night he saw a procession of men coming out of a mirror, but this did not frighten him. Further accounts which he gave of his episode are as follows: The man put saltpetre into his drink; it was like milk; this influenced his head, broke up his memory and made him lazy so he could not do his work. He also thought it took away his power of procreation and sensual feelings, and gave

him a pain in the back. Nevertheless, he went to work the next day. His boss, he claimed, told him he talked to himself and advised him to go home. The family noticed nothing special.

Another set of drinks taken with the same men later, again gave him a queer feeling, and this time he became afraid and ran out of the saloon without his coat. He again went to work but could not do his work so well. The boss told him at this time that he would soon finish his apprenticeship. Thereafter he did one job satisfactorily, but when the boss sent him and a girl out to put down a carpet he began to act queerly and to walk in the wrong direction, away from, instead of toward, the place where he was to do the work, although he was well acquainted with the street and house to which he was supposed to go. The girl returned to the boss, reported that he was queer, and he was sent home, and told to have his head examined. At home he was restless, walked the floor, and said everybody wanted " to do him."

He was then taken to a psychopathic pavilion, where he was moderately depressed, said they wanted to be rid of him at the store, that people were " framing him up," that they called him a " crook," and thought he had been " doped." At the hospital for the insane he was indifferent, said he heard voices saying " dirty things," and thought that his fellow patients were calling him names and that they were in league with the men that put the " white stuff " in his drink. He did not react in any special way to these ideas and seemed to be rather indifferent about them. At least there was not the natural resentment that one would expect of an individual with such ideas.

It is observed that there are two periods in this man's mental disorder. The first began four years prior to his admission to the hospital when he took up his final life work that was supposed to bring him to an independent position ; the second began when this independent position in life came definitely in sight. His ideas, which refer to him getting an independent position in life and finishing of his apprenticeship, are closely related with ideas of marriage. His make-up shows that it was precisely this from which he shrank so much. The final coming of the termination of his apprenticeship and the taking up of an independent position represent the precipitating cause. If this is so then here again, as in

so many other cases, the precipitating cause acts in the same direction in which the defect of his make-up tended.

It might be said, however, that there was no external necessity of his marrying the girl. This of course is true, but probably not an important argument as it is not likely that the external situation is necessarily of very much importance, because mating and propagation are a biological destiny and constitute an important internal demand which may be relatively independent of actual external situations. But whatever is thought of this the facts are that marriage on the one hand and the taking up of his life work and finishing his apprenticeship on the other were associated in the patient's mind.

In his mental disorder it is found that his ideas showed that he did not want to work, did not want to go through with his apprenticeship, did not want to propagate or have sensual feelings, all of which are connected with his ideas of marriage. His mental disorder harmonized with the rest of the features of the case, so that the personality or make-up, the precipitating causes and his abnormal ideas are expressions of the same innate tendency to defective adaptation.

The above case is by no means a rare one. It was picked at random and illustrates that certain traits of character, that might be modified if taken sufficiently early, serve in the genesis of at least one type of mental disease. It also illustrates, as is seen in so many other cases, that marriage is not a cure for nervousness, and that this long-entertained and cherished popular belief is an erroneous one.

In the study of dementia præcox numerous cases have shown early symptoms that were condoned by their family and friends as "hysterical" or "peculiar."

Such symptoms are undue shyness, avoidance of people, extreme reticence, changes in mood, irritability, inexplicable crying spells, intense religious enthusiasm and seemingly peculiar acts and conduct. Engagement, the approach of marriage or the birth of a child tend to exaggerate these symptoms and may even serve as the precipitating factor in an essentially chronic mental disease from which few recover, and the majority of whom remain under institutional care.

The prevention of this disease is a very laudable undertaking not alone from the economic standpoint but to prevent the sorrow, discomforts and unhappiness that it entails. The disease appears to be the culmination of a long period of bad mental hygiene that is the result of a faulty training and the crystallization of undesirable habits of thought and conduct that warp the personality. The principles of prevention therefore lie in the direction of proper mental training that should begin in very early childhood. To institute this, parents and teachers should recognize the warnings and danger signal of a possible mental breakdown. Seclusiveness in children and the tendency of others to leave them to their fate should be noted. If the true meaning of this was generally understood the home and school regime, including play, would be adjusted so that these less fortunate ones would be encouraged to take their place among others. This would tend to develop the stunted social traits so they might eventually exercise a desirable degree of self-assertion and the habit of seclusiveness and reticence be avoided.

Moreover, children who are liable to weave fancies about their supposed injuries and wrongs should have these directed toward some ideal of accomplishment and healthy fancies substituted for the whimsical and capricious ones. The real and fancied wrongs of children should be smoothed to the satisfaction of the child and they should be encouraged to make confessions of their feelings and desires.

Although it is recognized that some of these shut-in personalities appear destined to have a mental disorder, others may by suitable training and guidance avoid taking the wrong road that is filled with pitfalls and ultimately leads to mental ill health and disaster.

Obstetrics

THE PRESENT STATUS OF ENDOCRINE TREATMENT IN THE STERILITY OF WOMEN

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THE belief in the curative efficacy of animal tissues, or their extracts, may be traced through the literature of all ages to prehistoric man. It boasts the sanction of the Talmud, and counts among its early votaries—Mithridates, King of Pontus: Andromachus, body physician to Nero, and many other ancients of equal fame.

The Egyptians and the Persians, the Greeks and Romans: Hippocrates: Pliny and Galen, all advocated and employed animal tissues, organs or secretions in the treatment of disease.

Disordered organs were corrected by the ingestion of normal organs, and where the morbid manifestations presented a polymorphous aspect, pluriorganic mixtures, like our pluriglandular preparations, solved the problem.

The Dyspensatory of Cordus, published in Nuremberg during the sixteenth century, presents the authenticated inspirational source of the witches' concoction in Shakespeare's " Macbeth ":

> " Fillet of a fenny snake,
> In the cauldron boil and bake;
> Eye of newt and toe of frog,
> Wool of bat and tongue of dog,
> Adder's fork and blind worm's sting,
> Lizard's leg and owlet's wing,
> For a charm of powerful trouble,
> Like a hell broth boil and bubble."

The Pharmacopœia Germanica of the sixteenth century describes " distillates of Capon and Pullet; Wolf Liver; Fox Lung; Deer Spine; Inner Membrane of Chicken Stomach; Gallstones of Ox; "

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in addition to which the apothecary of that time was called upon to furnish " Cranium humanum;" " Oleum Ossium humanorum," and many other similar products.

The direct progenitors of modern organo-therapy in the treatment of procreative disorders may be traced through this ancestral lore to the " Liquor Vitæ " or " Elixir of Youth," a preparation of testicular substance elaborated and administered by Susruta about 1000 years before the Christian era.

Its reputed efficacy was based upon the ancient dogma which attributed to all animal tissues, automatic functional potentialities, the substance of a given organ exercising a specific stimulating influence upon the function of a similar organ. Thus, testicular preparations were administered to both sexes for the purpose of stimulating or perpetuating the libido, and incidentally enhance fecundity.

According to some early chroniclers, certain Oriental tribes practiced a form of selective cannibalism with the object of acquiring the endowments and propensities attributed to certain human organs, especially the genitalia.

Twenty-nine hundred years thus span the interval from Susruta to Brown-Séquard, who by his rejuvenated rehabilitation and enthusiastic exploitation of testicular therapy, initiated the impetus to the evolution of modern endocrinology.

Every rational therapeutic effort must be based upon a clear conception of its aim and scope.

To arrive at a true estimate of endocrine treatment in the cure of sterility, it is essential to govern our consideration by established therapeutic postulates, which, reduced to their simplest form, demand the logical Why? When? and How? of the method.

We must know *why* endocrines are indicated in order to determine *when* they are indicated and to formulate the *how* of their administration.

From the therapeutic point of view the term sterility is purely relative, necessarily implying in a given case the presence of approximately normal anatomic and physiologic essentials to conception without the consummation of offspring.

Ovulation, fertilization and nidation constitute the cardinal phases in the chronological cycle of conception, and any perversion in their normal concurrence determines sterility.

Physiologically every woman who menstruates ovulates: Biologically, ovulation predicates potential fecundity.

We cannot create a function, we can only attempt to activate one existing in latent state, stimulate one that is deficient, or possibly mobilize one tentatively inhibited.

The maturation of a graafian follicle and liberation of its contained ovum, the evolution of the corpus luteum, the concurrent endometrial transmutation essential to deciduation, the subtle biotactic factors that dominate ovular fertilization and nidation, are all susceptible to inhibiting influences, temporary or permanent, local or systemic, most of which involve problems far beyond our diagnostic horizon and therapeutic scope.

Who can explain why the conjugation of a perfectly normal female, with an equally normal male, proves sterile, while the subsequent union of each with another, demonstrates the fecundity of both.

To apply the serological hypothesis of " a selective ovular immunity to certain strains of sperma " in explanation, is mere terminological juggling.

Sterility is a question of seed and soil. We cannot control the seed, we can only attempt to enhance its virility by correcting a deficient soil.

We cannot control the ovule, we can only aim to correct certain apparent abnormalities *presumably* inimical to ovulation, fertilization or nidation.

The study of endocrinopathic sterility must begin and end with the development and function of the ovary as a link which is reciprocally dominated by every other link in the endocrine chain.

The domination of the endocrines on the functional activity of the ovaries manifests itself from fœtal life throughout the reproductive period to the stage of senescence.

On the other hand, just as the determination of sex is decided in the ovum before fertilization, so the future fertility or sterility of the individual is frequently an ovular preordination governed by teratological laws and not by those of endocrinology.

We know that endocrinic disturbances can and do involve the reproductive organs, but we do *not* know how or why such involvement occurs.

The *newly born infant* frequently exhibits an evanescent stimula-

tion of its latent gynecic function, as evidenced by the appearance of colostrum and uterine bleeding, ascribed to the influence of hormones derived from the maternal placenta.

During infancy a few graafian follicles develop to a certain stage, then regress.

Castration at this period results in the characteristic eunuchoid types, while the opposite extreme is noted in rare instances of precocious sexual maturity *without discernible* cause or lesion.

" The Pineal and Thymus, the so-called puberty glands, flourish until puberty is established, then atrophy. If they cease to functionate before this time, precocious puberty supervenes; if their activity is prolonged beyond this time, infantilism and even sex reversion may result."

In the human female the onset of maturity is manifested by the appearance of menstruation; this coincides with a fixed period in the ripening of a follicle and is followed by follicular rupture and the development of a corpus luteum, which later regulates the menstrual cycle and dominates deciduation.

During pregnancy the pituitary undergoes manifest alterations, while variations in adrenal, thyroid, parathyroid and pancreatic functions are frequently noted.

The menopausal amenorrhœa announces the permanent suspension of ovular maturation.

The ovary and thyroid seem to promote each other's activity. The latter enlarges at puberty, during menstruation and pregnancy.

Gestation aggravates goitre and Grave's disease. In hypofunction of the thyroid the genitals suffer in development and function. The hormone of the parathyroids has an action similar to ergotin.

Less obvious are the relations between the hypophysis and female genitalia; hypopituitarism inhibits their development, but so does the opposite condition of hyperpituitarism.

Conversely, oöphorectomy is sometimes followed by acromegaly. The phenomena of overgrowth, occasionally observed during gestation, are doubtless due to the involvement of the hypophysis.

Destruction of the *pineal* body has resulted in precocious sexual development. The relations of the thymus and ovary appear paradoxical. The adrenals are activated by pregnancy and are responsible for its chloasma and various other phenomena. Puerperal osteomalacia appears to be due to a general endocrinic disturbance.

Every phase in the clinical problem of endocrinopathic sterility revolves around the question of diagnosis. Such a diagnosis obviously implies, in a given case, *the exclusion of every other pathogenic factor* in the causation of the sterility and the *elicitation of evident pathognomonic endocrine stigmata.*

Here we encounter our limitations, for in the present state of our knowledge, it is always difficult and frequently impossible to fulfill these diagnostic demands.

The nearer the symptom-complex conforms to a fully developed or readily demonstrable endocrinopathic type the farther the sterility recedes from therapeutic consideration.

No one would attempt to treat the sterility of acromegaly, Grave's disease, myxœdema, or Addison's disease. These fully developed, characteristic and readily recognizable types, represent the permanent and irremediable end results of their disorder.

It is the woman with ill-defined, obscure and dubiously suggestive stigmata of endocrine disturbance whose sterility offers the most fertile field for endocrine exploitation.

The elicitation of semeiologic criteria in these cases demands the minutest analytical scrutiny of anamnestic, objective and subjective details. To quote from an eminent endocrinopath: "Never be satisfied with the apparently simple answer that may superficially appear, but always insist on tracing back to first beginnings even the most minute complaints referable to endocrine disturbance. You will usually find structural anomalies to bear out your suspicion of such disturbance—the size and spacing of the teeth, the malformations of the face and skull, the character of the hair and possible reversion to the other sex in its distribution, the size of the extremities in relation to the trunk, the pigmentation of the skin, the adiposities, the vasomotor skin reactions, the blood-pressure, and the mental reaction of the patient—are but a few of the characteristics to be weighed. The patient is then to be treated—irrespective, it may seem, of her actual gynecological complaints—on the basis of the original internal gland at fault. . . ." (Timme.)

To focalize a maze of such symptomologic fragments on "the original gland at fault" in sterility demands a diagnostic perspicuity that borders on divination.

Another noted contemporary states that: "The life of every individual is dominated by his ductless gland chain." He further con-

tends that: " Given the history of the diseases of an *unseen individual,* one versed in endocrinology may often give such a striking description of that person's physical appearance and psychic traits as to create suspicions of wizardry."   (Garretson.)

Following such claims to their logical conclusion, we may soon expect to hear reports of cures by " absent treatment."

Hamlet's prophetic soul is thus repudiated, for,

> " There's ' an *endocrinity* ' that shapes our ends,
> Rough hew them how we will."

The application of direct functional tests, such as compliment fixations and deviations; specific ferment reactions; adrenal mydriasis test; the hypophysis test; metabolic studies and sugar tolerance tests, along the lines of Abderhalden's theories on the bichemical reactions among the protective or defensive body ferments, while as yet in their probationary stage, give promise of future light in this perplexing simeiologic labyrinth.

The diagnostic and therapeutic problems become even more complicated in cases which reveal evidences of an endocrinopathic disturbance plus insidious gynecologic infections, especially mild grades of chronic endocervicitis.

Sooner or later the progress of such an infection involves the ovaries by lymphatic continuity, the resulting inhibition of ovarian function breaks the local link in the endocrine chain, which is symptomatically reflected from distant links, thus reproducing the entire complex, but in reversed pathogenic order.

In other words, a vicious circle is established, in which the sterility with its ovarian origin presents the cause and not the result of a general endocrine disorder, and it follows that in such a case not endocrine therapy, but the eradication of the endocervical infectious focus is indicated.

If the same minute, analytical scrutiny as applied to the *sterile* woman, were applied to *fertile* women, it would reveal some evidence of endocrine disturbance in *every instance,* for, paradoxical as it may appear, we find *fecundity* in *pronounced endocrinopathics* as we find *sterility* in *normal women.*

The statistics of every maternity service record deliveries in cases of dwarfism, gigantism, Graves' disease, myxœdema, acromegaly, diabetes, and other fully developed endocrinopathic states.

If conception is possible in such advanced stages of endocrine disease, then the alleged etiological bearings of endocrines on sterility demand some radical modification and qualification.

To treat every case of sterility with endocrines regardless of its pathogenesis, as recently advocated, is about as rational as to dilate, curette, or incise every cervix for the same purpose, and will probably yield about the same results.

It must always be borne in mind that we cannot treat the sterility as such; we can only counteract some apparent underlying factor.

The normal ovaries are *born* with *their full quota* of from 40,000 to 60,000 ova. We cannot augment this quota.

Under normal conditions *one* ovular follicle maturates, ruptures and releases its ovule, for each menstrual cycle. These cyclic ovular phases are chronologically correlated to certain periodic alterations in the corporeal endometrium.

Ovulation normally occurs from the sixteenth to the nineteenth day after the onset of menstruation, a fresh corpus luteum being invariably present in the premenstrual stage of the endometrium, so that the condition of the uterine mucosa can be accurately predicated from the corpus luteum, and *vice versa*. It follows that menstruation, as the outward manifestation of ovulation, thus presents both a clinical index of potential fertility and a criterion of therapeutic efficacy. In short, any treatment that converts an abnormal into a normal menstruation establishes normal ovulation and may be said to cure sterility.

Terminology dominates concept and by common usage the terms hyperfunction, hypofunction, and dysfunction are applied to clinical types and their variants, denominating respectively augmented, diminished, or disordered output from a given gland.

But it must be recalled that a hyperfunction of one gland may be either the cause or the effect of a hypofunction in another, while a dysfunction denotes a complex of hyper- and hypofunction manifested alternately by the same gland.

Endocrinopathic sterility is neither a hypo-, hyper-, or dysfunction of the ovary; the ovules are there, but ovulation is in abeyance: whether this is due to the absence of an activating or to the presence of an inhibiting hormone, *we do not know, we cannot tell,* and cannot, consequently, formulate any specific therapeutic indications.

Furthermore, it is essential to differentiate the strictly ovular from the metabolic phase of the ovarian function, for, while both phases blend physiologically, they are biologically and biochemically distinct and separate.

We seldom find a corpus luteum in *both* ovaries at *the same time,* nor do we ever find *two* corpora lutea in the same ovary. This plainly indicates that ovulation alternates monthly from one ovary to the other, a significant phenomenon generally ignored by investigators, which signalizes *the purely autonomous* nature of ovulation, *for no hormone activation from distant glands could possibly exercise such a selective alternating regulatory influence.*

It is frequently possible to ameliorate the systemic manifestations of a directly or indirectly disordered ovarian biochemism by the administration of proven or alleged antagonistic or synergistic endocrines, but no substance known to us to-day exercises the slightest direct influence on the ovular function of the ovary as such.

We have characterized menstruation as the index to ovulation and the criterion of its therapy. The domination of the corpus luteum in menstruation and deciduation, its persistence and growth during pregnancy, and its cyclic menstrual recurrence during the procreative period, have naturally led to its empirical application in the treatment of sterility.

Physiologically, the corpus luteum *inhibits* ovulation: experimentally it manifests properties apparently *antagonistic* to those of the ovarian stroma proper.

The corpus luteum itself elaborates at least two mutually antagonistic principles, one, the " luteolipoid," a hæmostatic, the subcutaneous administration of which, during menstruation, *abbreviates* or inhibits the flow; the other, lipamin, is a lipoproteid, a leuthalbumin which *accelerates* or augments the menstrual flow and stimulates genital development.

Theoretically, the luteolipoid should fulfill all the indication in excessive menstruation and the lipamin in amenorrhœa and genital hypoplasia, but, unfortunately, these pharmacological revelations have not been realized beyond the confines of the research laboratory.

The corpus luteum and its active principles are cyclic productions, each phase of which must necessarily develop a correspond-

ing graduation in biochemic potency, the degree of such potency cannot possibly be the same throughout its monthly cycle, for if it were, there could be neither beginning nor end to menstruation.

This obvious postulate is entirely ignored in the preparation and administration of the available commercial corpus luteum products and explains, in part, at least, the contradictory results of their therapeutic application.

The thyroid and pituitary exercise a stimulating effect upon the development and functions of the reproductive glands; when either is deficient before puberty immature genitalia result with consequent sterility.

In animal experiments extirpation of the pituitary is regularly followed by ovarian atrophy; this correlation suggested pituitary as an ovarian stimulant.

The involvement of the adrenals and thyroid during pregnancy, when ovarian and corpus luteum activity are at their height, is manifested by subcutaneous infiltrations, myxœdematous in character, general sluggishness, and cutaneous pigmentations.

Compensating for these conditions the thyroid is frequently pushed beyond normal limits and goitre becomes evident.

In a minor degree menstruation occasionally induces similar symptoms.

Embryologically, the adrenal cortex is identical with the interstitial cells of the ovary, and removal of the adrenals in rabbits causes hypertrophy of the ovarian interstitial tissues, while removal of the ovaries induces hypertrophy of the adrenal cortex.

Therapeutically, however, both adrenalin and pituitrin exert purely temporary effects on the genitalia; they do not replace the functional activity of the gland from which they are derived.

If all the endocrine disturbances conformed to certain pathognomonic monoglandular types and our knowledge always enabled us to specify a hypo- or hyperfunction of the gland involved, the problem would be exceedingly simple, but as Timme states, " there is no syndrome involving a dystrophic activity of one or even two of the endocrine glands. Every disturbance in the internal glandular mechanism involves of necessity every single one of these structures; all cases are pluriglandular."

" Here and there, the symptoms due to a certain gland stand out

sharply in the clinical picture, but this gland, far from being the real cause of the difficulty, is frequently the last one involved and the one to be disregarded in the therapy." (Timme.)

When we know Why? When? and How? each of the internal secretions stimulates or inhibits; when we have learned to recognize the synergists and antagonists; when we can formulate their normal and pathological biochemic equations: when the pharmacological potentialities of animal extracts as applied to the human functions are established, then, and not until then, will the Why? When? and How? of endocrine treatment in sterility merge from pure empiricism into a rational practice based upon fixed fundamental principles.

Many women undoubtedly conceive during a course of organotherapeutic experimentations, as they also do after other methods of treatment, rational and irrational, but to attribute an eventual fecundity to the curative effect of this or that procedure, simply because it so happened, is an obvious " post hoc ergo propter hoc " interpretation without substantiation, for it must be conceded that many women presenting identical indications ultimately conceive with or without endocrine or other treatment, while, on the other hand, a very large proportion of those so treated remain sterile.

When all is said that can be said to-day of the endocrines in sterility, the entire subject may be epitomized, as a treatment in a condition of which we know little by means of which we know less. The foregoing delineation of the controversial aspects of our theme must not be misconstrued as underestimating the truly vital significance of *endocrinology in general;* its horizon glows with far-reaching possibilities, but at present we stand in the early dawn; let us hold to firm ground, and, with Mark Twain's penchant for homely truth, recall that: " It ain't so much our ignorance that makes all this trouble, *but the things we know that ain't so."*

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Surgery

INTRATHORACIC GOITRE *

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INTRATHORACIC goitre is defined as one in which the greater part of the enlargement in the thyroid is situated within the thorax. This type is distinguished from a substernal goitre which is usually a projection of one part of the thyroid into the chest. The totally intrathoracic type occurs in the form of an adenoma, cyst, or tumor within the mediastinum and there may or may not be any evidence of goitre in the cervical region. The lower limits of the substernal goitre may be outlined when the patient swallows, while the upper limits of the intrathoracic goitre may just be perceptible.

The intrathoracic goitre usually originates from one of the lower poles of the thyroid gland. It has been said that it frequently originates from the isthmus, but our observations lead us to believe that it begins more often in one of the lateral lobes. If it develops from a part of the cervical thyroid it always retains some connection with it, either a direct continuation of thyroid tissue or at least a communication of fibrous tissue. This connection between the cervical and intrathoracic parts of the goitre occurs only when the intrathoracic enlargement originates from the thyroid. If the intrathoracic enlargement arises from an aberrant thyroid in the mediastinum there is no connection between the two. While it is possible that a goitre may develop from aberrant thyroid tissue situated anywhere from the tongue to the mediastinum, apparently intrathoracic goitre does not often originate in this manner. In a few instances we have seen the intrathoracic tumor completely separated from the thyroid gland; in one of our cases, the cervical goitre had been removed elsewhere apparently without the knowledge that an intrathoracic tumor existed

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(Figs. 1 and 2). It has been our experience that intrathoracic goitre most often develops from the lower pole of one of the lateral lobes of the thyroid. Certain kinds of cervical goitre apparently tend to become intrathoracic; this tendency, according to Crotti, is increased by coughing or swallowing, or by certain rotations and flexions of the head, and by gravity. These tendencies, however, would not influence a fixed goitre, although they might influence one which is already movable, such as the diver's or floating type, or cases of thyroptosis. Von Eiselsburg has called attention to the thyroptosis which occurs often in older persons with emphysema, and says that this condition tends to make the goitre intrathoracic. Undoubtedly many intrathoracic goitres are first cervical, although they dip into the mediastinum with the motions caused by coughing and swallowing. As they become larger they become more or less fixed under the sternum and later they become totally intrathoracic (Figs. 3, 4, 5 and 6). Those originating from the aberrant glands are intrathoracic from the start. Substernal projection of the lobes of the thyroid occurs in almost 50 per cent. of the patients who come for operation while the intrathoracic goitre represents less than 5 per cent. of the total cases. The totally intrathoracic goitre without evidence of cervical enlargement represents less than 1 per cent. of all goitre cases.

All the histologic types of goitre occurring in the cervical region may also occur within the chest; nevertheless, nearly all our cases were very distinct in type. The most common is the fœtal adenoma or cystadenoma. These tumors make up the greatest part of the growth, although there is the usual capsule and colloid material. The adenomas in many of the cases have degenerated and there may be calcareous nodules. The hypertrophied gland of the exophthalmic type is never seen in the totally intrathoracic goitre and, as a matter of fact, we have never seen a thyroid lobe entirely within the chest. The intrathoracic goitre is always an outgrowth from one part of the gland, or is separate from it. A substernal projection in an exophthalmic goitre is common. A neoplasm such as carcinoma sometimes invades the intrathoracic thyroid; it then usually becomes fixed very early to the surrounding tissue and is most difficult to eradicate in a manner to benefit the patient. Sudden and continuous symptoms of suffocation as a result of one of these tumors suggest malignancy, and the condition is likely to be hopeless.

FIG. 1

(Case 231252.) Intrathoracic goitre after operation elsewhere for removal of cervical goitre.

FIG. 2.
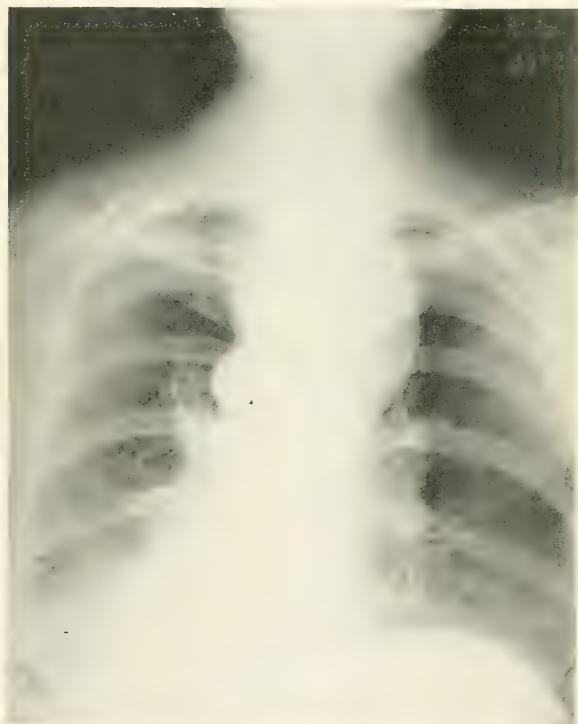
(Case 231252.) X-ray of intrathoracic goitre of patient shown in Figure 1. Goitre from aberrant thyroid.

FIG. 3.
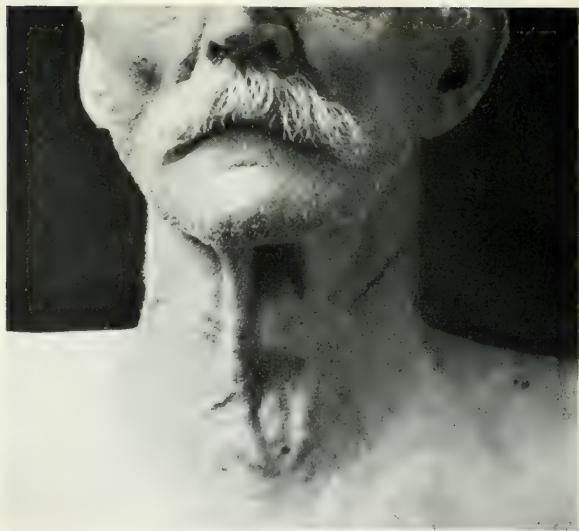
(Case 272595.)   Intrathoracic goitre almost completely fixed under sternum, before operation.

FIG. 4.
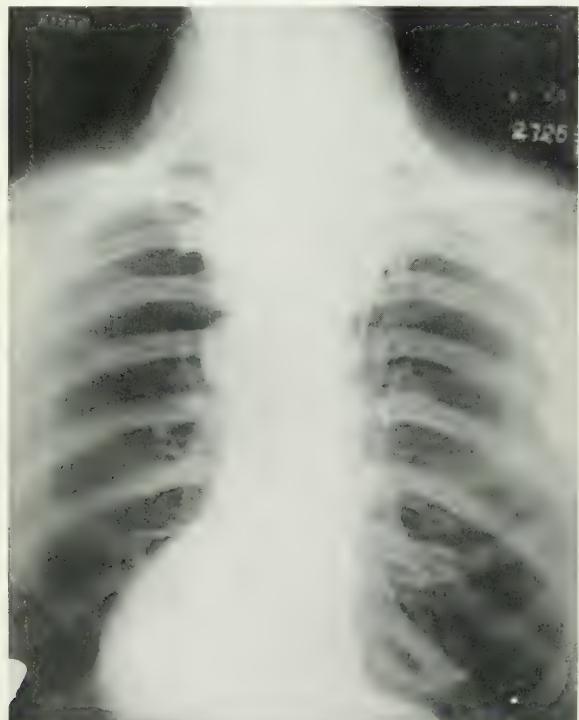
(Case 272595.)   X-ray of intrathoracic goitre of patient shown in Figure 3, before operation.

FIG. 5.
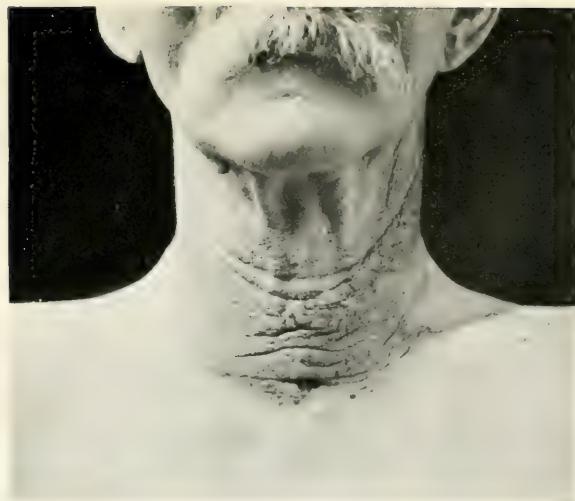
(Case 272595.)   Patient shown in Figure 3 after removal of intrathoracic goitre.

FIG. 6.
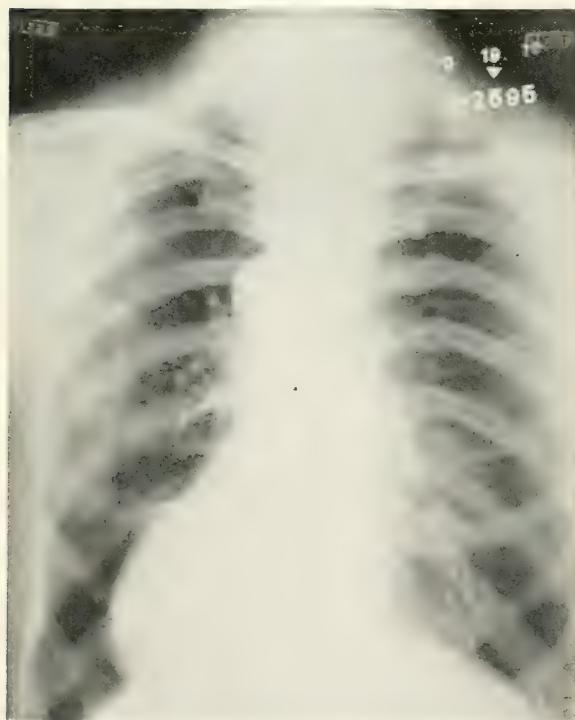
(Case 272595.)   X-ray of patient shown in Figure 3 after removal of intrathoracic goitre.

Fig. 7.
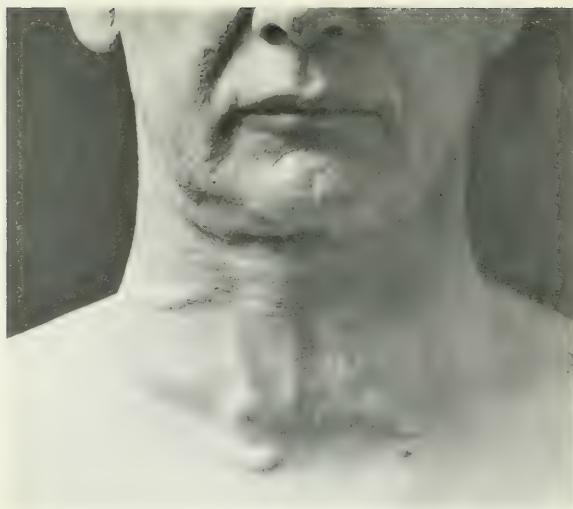
Case 29477S — Intrathoracic goitre — Dilatation of superficial vessels of the neck before operation

Fig. 8.

Case 29477S — X-ray of patient shown in Figure 7 before operation

The relation of the intrathoracic goitre to the surrounding structures has been a bugbear in operating for this condition. Undoubtedly great concern is warranted because the growth lies surrounded by many of the vital viscera; however, I am able to recall but one instance in which any of these structures were seriously injured and in this case the final result was satisfactory, but it was necessary to pack the entire mediastinum to control the deep bleeding. In only two of our entire series of operations have we resorted to a pack to control hemorrhage, and both of these were done some years ago. Although the intrathoracic tumor is in intimate relation to the right and left innominate artery and vein, the common carotid arteries, the arch of the aorta and base of the heart, thoracic duct, pneumogastric, recurrent laryngeal, phrenic, and sympathetic nerves, the trachea, and the œsophagus in the benign cases, it is definitely encapsulated and can usually be enucleated from its capsule without serious difficulty if the proper technic is employed. None of the arteries, veins, or nerves named have branches which go to the thyroid. Under ordinary circumstances the lowest circulation to the thyroid is through the inferior thyroid artery and vein and these communicate with the thyroid gland about half-way between the upper and lower poles; this point remains the same no matter what position the intrathoracic part occupies. The normal arrangement of the circulation to the thyroid gland must be remembered in operating for an intrathoracic goitre. Malignant growths are difficult to remove because the disease infiltrates the surrounding tissues, so that there is no opportunity for enucleation. The infiltration destroys the nerves and causes complete loss of voice; it also destroys the cartilages and at times, therefore, results in collapse of the trachea. No matter how large the benign tumor is it exerts its influence on the surrounding structures only by pressure. The pressure may be so great that the patient can scarcely get a sufficient amount of air, due to compression of the trachea and bronchi and sometimes even a part of the lung. It is surprising how very marked the tracheal deformity may be without causing much inconvenience. The trachea may be almost completely collapsed antero-posteriorly or almost completely angulated from side to side and yet the patient may show no signs of cyanosis. Frequently I have observed the trachea flattened like a ribbon so that the lumen could be no more than a mere slit and I have wondered at the slight

amount of trouble resulting from this condition. Pressure from the growth on the large vessels may seriously interfere with the normal course of the circulation so that the superficial vessels of the neck and chest become very greatly dilated in their endeavor to compensate for this pressure (Figs. 7 and 8). The greatest abnormality of this kind is more often seen, however, in other lesions of the mediastinum than in goitre. Intrathoracic goitre, more often than cervical goitre, causes disturbance in the recurrent laryngeal nerve. A marked limitation in motion in one of the arytenoids suggests the presence of a mediastinal goitre.

The symptoms caused by intrathoracic goitre differ from those caused by ordinary cervical goitre in their being more intense. Suffocation and choking spells are often produced by slight exertion, or they may even come on during sleep. Sometimes the patient may not be able to breathe except by holding the head in a certain position. In the early stages of the trouble the symptoms resemble those seen in the asthmatic, and often these patients are treated for asthma. If the tumor lies posteriorly it may interfere considerably with swallowing, and choking will be pronounced. Occasionally the tumors may be felt by introducing the finger into the pharynx. In one case of large intrathoracic goitre without cervical enlargement the only symptom was suffocation when the patient leaned forward, and, since nothing definite could be found on physical examination, the diagnosis was not clear until an X-ray examination was made. Pressure on the trachea and bronchi may result in such auscultatory changes in the chest that until the diagnosis is settled a lesion in the lung may be suspected. Ptosis and fixation of the larynx have been cited by Kocher as one of the features in the differential diagnosis, and the condition is often noticeable, especially in the presence of a large tumor. The so-called mechanical goitre heart, which may be due to cyanosis, and a toxic goitre heart are often associated conditions. In many instances, the syndrome of the thyrotoxic goitre exists. Many of these patients have had the trouble for a long time and most of them show evidence of degeneration of the glands as well as hypertrophy in the adenomas. Some cases are mentioned (Crotti) in which the growth became so large that the manubrium of the sternum was displaced forward. The diagnosis of the condition is not difficult in the partially intrathoracic cases and in those that are associated with cer-

vical goitre. The feeling of an impact if the finger is pressed into the sternal notch when the patient swallows will make the diagnosis in some cases. Frequently a mediastinal tumor is recognized, but it may be difficult to determine whether the tumor is an intrathoracic goitre, an enlarged thymus, syphilis or tuberculosis of the mediastinum, or possibly an aneurism of one of the large vessels. In such cases the X-ray is especially helpful in the differential diagnosis. In almost every instance an expert röntgenologist can decide the nature of the lesion from the characteristics of the picture.

The prognosis of operation for the removal of the intrathoracic goitre is much better than might be expected, in spite of the fact that the tumor, surrounded by many large vessels and nerves, is interfering greatly with the breathing apparatus; the technical part of the operation is seldom the cause of death. Kocher's mortality was about 1 per cent., and in our series of cases of several hundred intrathoracic goitres no death has resulted from the operation itself. The principal difficulty in these cases is the same as in the thyrotoxic cervical goitre. The mortality in all thyrotoxic goitres is about 3.5 per cent.; death is due to the fact that damage caused by degeneration of the heart muscle has reached the critical state. Most patients with thyrotoxic goitre stand the operation well, but they belong to the group of cases in which sudden death may occur from acute dilatation of the heart.

The technic of the operation for the removal of intrathoracic goitre differs in only a few respects from that employed in the cases of cervical goitre. The few differences are very important, however. Operations have been described in which the manubrium is divided or dislocated or in which the upper ribs and clavicle are turned back to allow for the exposure of the lower part of the tumor. This may seem advisable in some of the malignant cases if operation is done, but I do not consider it necessary or advisable to interfere with the chest wall in the benign cases. The chief points to be remembered in the operation are that while the goitre lies in close proximity to very important structures it is separated from them by a capsule so that the tumor may be enucleated without injury to the structures. Another point which should be kept in mind is that the vessels to and from the thyroid gland are the thyroid vessels and that although the superior vessels are always at the superior pole of the gland, the inferior vessels are never at the inferior pole, so that the intrathoracic

goitre is always below the inferior vessels, and, while the inferior thyroid artery arises from the thyroid axis, it always passes upward and usually enters the thyroid at about the middle of the lateral lobe. Other vessels are the lateral veins which pass off from all parts of the gland (Fig. 9).

The first steps in the operation for the removal of the intrathoracic goitre are the same as in the ordinary thyroidectomy. As soon as the thyroid gland has been exposed (Fig. 10), the thyroid muscles should be divided on one side, and on both sides if it is more convenient and gives better exposure. The division of the muscles is not necessary in all cases of cervical goitre, but I am sure that it is best in the intrathoracic. The next step in the operation, the complete isolation and freeing of the upper pole of the gland, is the most important (Figs. 11 and 12). I believe that deep goitres should not be approached from the side or from below until the upper pole has been completely freed. It is surprising how mobile the intrathoracic part of the goitre becomes after the upper pole has been freed and separated from the side of the larynx and trachea. The lateral veins may now be divided and this leaves the gland attached only to the inferior thyroid vessels. By tracting on the upper pole of the gland and by gradually freeing the intrathoracic part with the finger the whole lobe and intrathoracic tumor can usually be lifted up into the neck and turned over onto the trachea without in the least interfering with breathing (Fig. 13). If the goitre seems adherent to the deep structures it may be possible to enucleate it by thrusting the finger into the deep adenoma. If the whole gland is lifted into the neck the inferior vessels can be seen and handled without difficulty. Careful dissection from above downward has almost entirely done away with the tragic stage of the former operation, when the patient became greatly cyanosed as the deep part of the goitre was being forced up before the upper pole was liberated. Occasionally the trachea may collapse and it is always well to be ready to perform a tracheotomy, although it is seldom necessary.

During the first few days after the operation the swelling in the neck may be so marked as to produce sudden choking spells and marked cyanosis. On this account it is advisable in these cases to have a tracheotomy outfit ready in the patient's room. This precaution is taken in all our cases of goitre in which there is either a fear or a suggestion that there may be difficulty. It is preferable in these

FIG. 9.

External
and internal
carotid
arteries

Superior thyroid
artery
and
vein

Vagus nerve

Thyroid gland

Inferior
thyroid
artery
and
vein

Internal jugular
vein

Thyroid axis

Recurrent laryngeal nerve
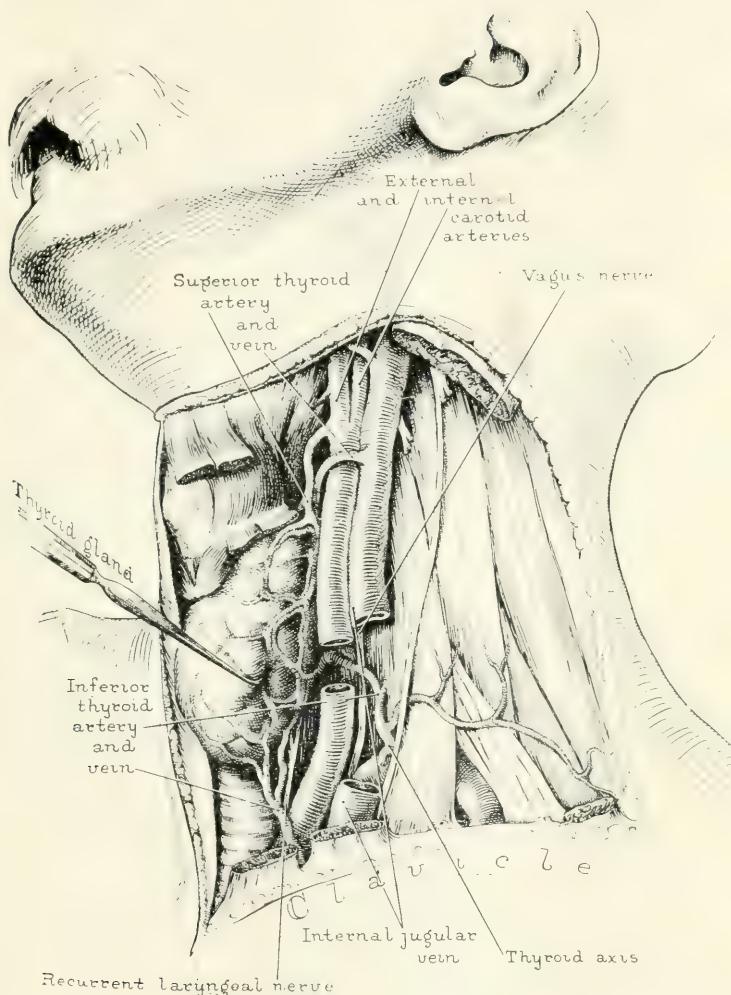
Anatomic relations of the thyroid gland. Entrance of inferior thyroid vessels exposed.

FIG. 10.

Platysma
myoides

Superficial
fascia

Anterior jugular veins

Incision through superficial tissues.

Fig. 11.

Platysma muscle

Sternothyroid and omohyoid muscles

Sternothyroid muscle

Sternomastoid muscle
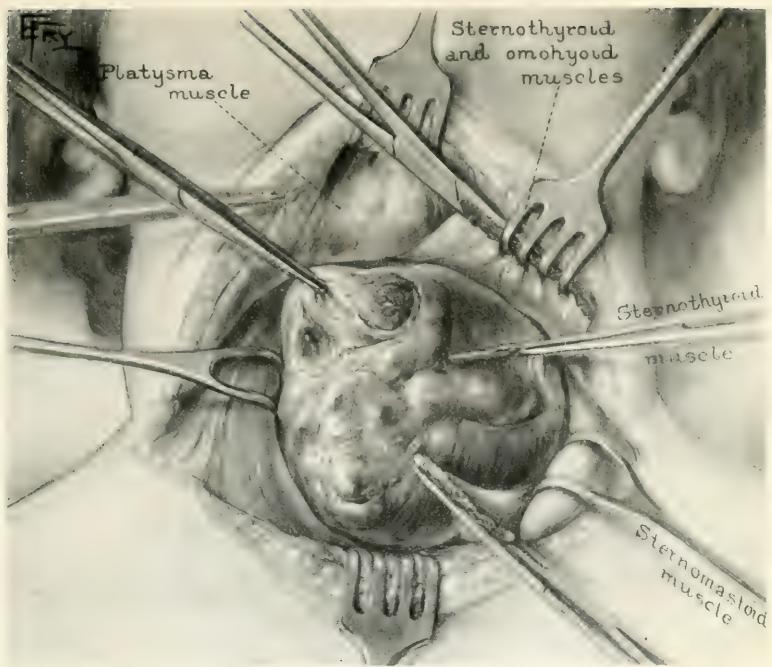
Freeing the upper of the thyroid gland after the muscles have been divided.

Fig. 12.

Superior thyroid vessels

Sternohyoid and sternothyroid muscles

Inferior thyroid artery
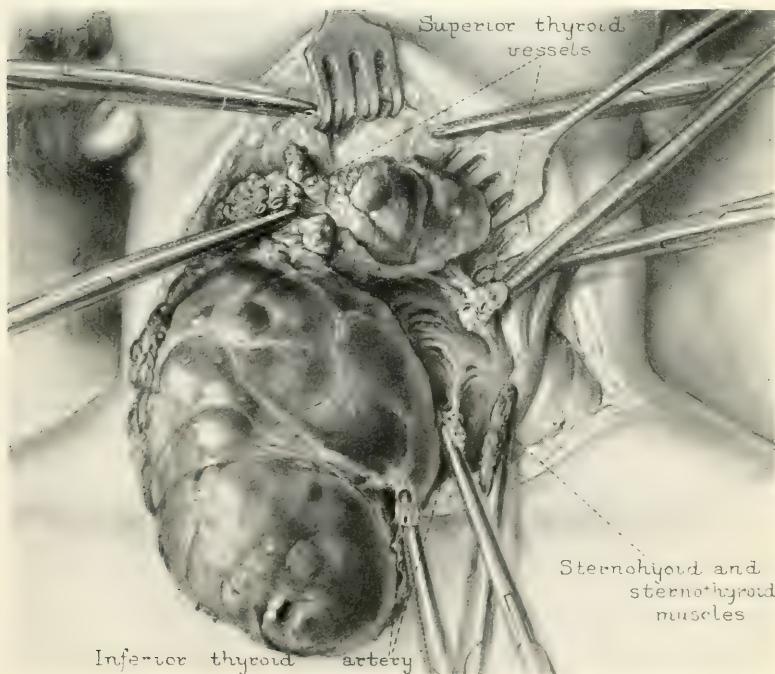
Vessels of the superior pole divided and completely isolated.

Fig. 13.

Superior thyroid vessels

Sternohyoid and
sternomastoid muscles
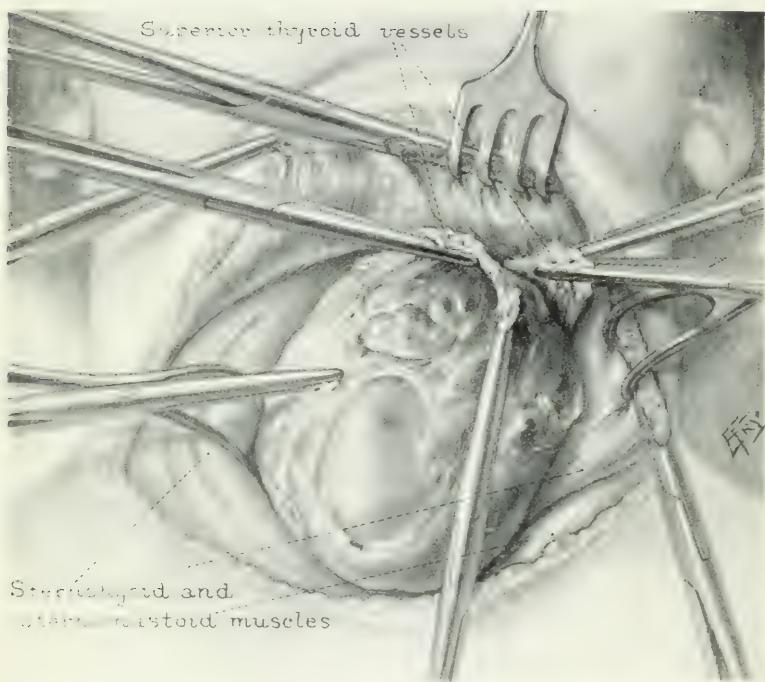
The intrathoracic portion of the gland pulled up from its deep position and the inferior thyroid
artery divided.

cases to keep the trachea open for several days rather than to allow the patients with damaged hearts to have repeated choking spells or to pass through a long period of labored breathing. About one in every 500 goitre cases requires a tracheotomy.

Dr. J. A. H. Magoun has made a careful study of the records of the 150 cases of substernal and intrathoracic goitres in which operation was done in the clinic during the year 1918.

Contrary to several writers it was found in our series that intra-thoracic goitre is more common in the female than in the male; 124 of our patients were females and 26 were males. As this condition is often associated with cervical goitre, and as cervical goitre is much more common in the female, it seems likely that the proportion of females to males will hold in the intrathoracic cases.

Table I shows the distribution with regard to age as it occurred in our series. The condition was more common between forty and fifty years of age than at any other period of life; almost all the patients were between thirty and sixty.

Table II gives the number of years of duration of the goitre.

A review of the clinical pictures presented (Table III) showed that the chief complaint was a sense of pressure (sixty-one cases), although forty-two patients said that they were not aware of any pressure. Dyspnœa was quite marked in fifty-four cases. One of the characteristic pictures in intrathoracic tumor is the dilatation of the veins over the lower part of the neck and upper part of the chest; this was very noticeable in twenty-two of the 150 cases. Dysphagia was present in thirteen cases; pain in the chest was mentioned in only five cases. Not all the 150 goitres were completely intrathoracic and therefore many of them did not cause the marked symptoms fre-quently present.

The tumor was found on the left side in eighty-one cases, and on the right side in forty-five; the operator described the growth as being in the middle in only four cases (Table IV). Undoubtedly the lateral tumors arose from the lobes on the respective sides, and the four tumors found in the midline probably came from the isthmus. In six-teen cases the condition was bilateral.

A review of these tumors from the standpoint of pathology showed that 141 had been classified as adenomas, one as hypertrophy, which undoubtedly meant that there was hypertrophy with small adenomas,

four were carcinomas, and two were colloid goitres with small adenomas. If a preoperative diagnosis of malignancy of the thyroid is made, ordinarily we do not advise operation because when the malignancy has reached the degree at which it can be recognized clinically, it has already infiltrated the surrounding tissues to such an extent that surgery does not offer much hope of cure. In addition, the operation is very dangerous when the lesion is malignant. So far as we could determine from the lack of attachment to the cervical thyroid, three of the 150 tumors had originated from aberrant thyroids. Table V shows the estimated distance that the enlargements extended into the mediastinum.

TABLE I

Age	Cases
Ten to twenty years	3
Twenty to thirty years	14
Thirty to forty years	39
Forty to fifty years	49
Fifty to sixty years	36
Sixty to seventy years	9

TABLE II

Duration	Cases
One to five years	29
Five to ten years	22
Ten to fifteen years	21
Fifteen to twenty years	25
Twenty to twenty-five years	9
Twenty-five to thirty years	17
Thirty to thirty-five years	19
Thirty-five to forty years	2
Forty to forty-five years	2
Forty-five to fifty years	2
No record	4

TABLE III

Clinical symptoms	Cases
Sense of pressure	61
No pressure	42
Dyspnœa	54
Dilated veins	22
Choking	27
Dysphagia	13
Suffocation	4
Congested face	3
Rasping voice	4
Dysphonia	1
Pain in chest	5
Fluctuation in size of neck	2

TABLE IV

Situation	Cases
Left side	81
Middle	4
Right	45
Bilateral	16
Undetermined	4

TABLE V

Distance beneath Sternum	Cases
Slight	27
One-half inch	6
One inch	12
One and one-half inches	8
Two inches	20
Two and one-half inches	4
Three inches	10
Four inches	2
Undetermined	61

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THE COMPLICATIONS AND THE SURGICAL TREATMENT OF THE MALARIAL SPLEEN; WITH THE REPORT OF TWENTY-FIVE CASES

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THE cases that I am able to record in this paper are due to the kindness of Doctor Meerovitch, surgeon-in-chief of the City Hospital of Ekatherinodar, and to the junior surgeon of this hospital, Doctor Platonoff. They represent the total number of operations done on the malarial spleen in this hospital in the last twenty years and by the same two surgeons.

Ekatherinodar, the principal city of the Province of Kouban, with about one hundred thousand inhabitants, is situated in a plain on the borders of a navigable river, the Kouban, and fifty versts distant from the Caucasus Mountains. The River Kouban arises in the glaciers. Arriving in the plain, composed of a soft soil, it frequently changes its bed on account of the rapidity of its current and leaves behind it arms of stagnant water, which become rapidly filled with growths of reeds. The left bank is almost everywhere marshy.

In the spring, when the snow melts, and during autumn, which is the rainy season, the river leaves its bed, inundating the plain, and leaves behind enormous pools of stagnant water and extensive marshes, in the midst of which are large villages with a numerous population.

In the city itself, the streets nearest the river are inundated at the time of the river's rise, and when the water recedes large pools of stagnant water remain for months. Therefore, the anopheles finds a happy home in which to breed, and the entire population suffers from malaria in all its varied forms—tertian, quartian, and even the tropical type, which kills the patient in two or three days.

The ignorance and poverty of the population is the reason why malaria is so badly treated and why we encounter many cases of chronic infections which give rise to enormous spleens, ascites and nephritides, complicated by severe cachexia, leading to death.

Hypersplenia is an absolutely constant sign of malaria, be it acute

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or chronic, and its absence is uncommon, not more than 1.1 per cent. of all cases, according to Theodoroff's statistics.

The plasmodium of malaria, by collections in the spleen, sometimes in considerable numbers, produce, by their presence, a marked hyperemia of the gland, and at a later date other pathologic changes of the splenic parenchyma.

At the present time, it is very difficult to say whether or not this hyperemia is useful to the organism, as Metchnikoff maintained, as it serves as a defense on account of the exaggerated phagocytosis, or, as Laveran upholds, the parasites there find conditions particularly favorable for their development and the hyperemia is a reaction to this irritation. Finally, Jawein admits that splenic hypertrophy in infectious diseases is due to the irritation of the parenchyma from an accumulation of detritus of the red blood corpuscles.

In malarial subjects, the melanic pigment accumulates in large amounts in the splenic parenchyma, irritating it and setting up acute hyperemia and chronic hypertrophy of the organ.

At the onset of malarial infection and during its earliest paroxysms, the spleen usually increases in size to such an extent that it can be easily detected by palpation, and it is only in some rare cases that this hypertrophy can only be made out by percussion.

The normal spleen weighs from 170 to 195 grammes. In the acute types of malaria its weight may reach 300 to 500 grammes and 950 grammes as a maximum. Its lower border becomes rounded and extends below the costal border to the extent of several fingers' breadth. Its shape changes and the organ becomes more rounded. It is painful on palpation, and besides this, acute, spontaneous pains are complained of in the splenic region. The splenic capsule becomes tense, thinned, and sometimes ruptures when some slight trauma has been received, or this may occur spontaneously on account of the state of turgescence present during a paroxysm. The capillaries and venous spaces dilate and fill with blood rich in red blood corpuscles containing the parasite, as well as macrophages stuffed with detritus of both white and red cells.

The splenic pulp is soft, sometimes grumose; the follicles being lighter in color, stand out against a brick-red background.

During the early stages of acute malaria, the spleen usually returns to its normal state after the paroxysm has passed off, but if the disease drags on, if the attacks are frequently repeated, the splenic

hypertrophy becomes more stable, profound morbid changes of the organ occur, so that hypertrophy and sclerosis are the consequence.

In the neglected cases of malaria with cachexia, the spleen will be found unusually enlarged, and in these circumstances its weight attains from 900 to 1500 grammes, but it has been known to reach 4000 to 5000 grammes or even more. Laroyenne, of Lyons, removed a spleen which weighed 5300 grammes, and Jonnesco did a splenectomy for a malarial spleen weighing 5750 grammes. Several other such cases have been recorded. A spleen of such size will fill the entire left side of the abdominal cavity and extend down to the true pelvis and reach beyond the linea alba over to the right to the extent of several centimetres.

The chronic hypertrophy of the spleen produces an increase in the density of the organ on account of a connective-tissue proliferation of its framework. Malpighi's corpuscles, compressed by this neo-formed tissue, progressively atrophy; the veins, enormously dilated, assume an aspect of angiomata.

To nourish such an hypertrophied organ, the vessels assume very large dimensions. In my first case, operated on by Meerovitch, the splenic vein was the size of a finger, while in Nilsen's case this vein had a calibre of the small intestine.

CASE I, a female, æt. twenty-four years, entered the hospital on September 28. She had suffered greatly from malaria in childhood and her abdomen had progressively enlarged since then. This progressive increase in size ceased about six years ago. The patient complained more especially of weight, difficulty in breathing and impossibility to work.

The patient was well developed but anæmic. Menses occurred every third or fourth month, and were scanty. At the level of the umbilicus, with the patient standing, the abdomen increased 95 centimetres and 92 centimetres at the level of the xiphoid appendix. It was almost entirely filled by a smooth, hard tumor, which did not reach the extreme limit of the right epigastric fossa.

Below, it reached the pubis, while above the tumor covered the left lobe of the liver and a portion of the stomach, and extended into the left hypochondrium, which it caused to bulge. At the right limit of the tumor a small but deep notch could be felt. The tumor was slightly movable.

No peritoneal friction sounds. No relationship with the generative organs. Frequent desire to urinate. Some râles were found in the lower pulmonary lobes. The patient never had any œdema, but upon the slightest effort there is dyspnœa.

Patient had followed a quinine or arsenic treatment and several séances of faradization, following which epistaxis occurred.

On October 7 an incision 22 cm. long was made in the linea alba, starting at the xiphoid appendix. The spleen was easily brought out of the abdomen. Adhesions were few; the omentum was adherent to the organ at two points of small extent and was detached by the finger. The splenic ligaments were divided between two ligatures. The vessels of the hilum lienalis were first ligated separately and then *en masse*. Then an accident occurred.

A clamp had been placed on the splenic vein, which was larger than a finger, when suddenly the vein became torn just above the clamp, a hemorrhage ensued and instantly the abdominal cavity was filled with blood. The hemorrhage was quickly controlled by ligature of the vein. The walls of such enlarged vessels are thin and tear with ease. The abdominal incision was closed without drainage.

The spleen weighed 3670 grammes. Evening temperature, 37.2° (99° F.); patient felt well.

October 10. Temperature, 40.3° C. (104.6° F.); pulse, 120; face congested; numerous bronchial râles.

October 11. Temperature, 37.5° C. (99.6° F.). Fewer râles. General condition good. Perspired much in the night.

October 12. Temperature, 39.6° C. in the morning (102.8° F.); evening, 41.3° C. (106.2° F.), but patient felt well.

By October 14 temperature had reached normal and the patient was discharged on November 7, feeling perfectly well.

Repeated attacks of perisplenitis cause considerable thickening of the splenic capsule, and at certain spots this thickening is more marked. Likewise, at certain spots the connective-tissue may even become transformed into cartilaginous or bone tissue.

CASE II.—Female, æt. twenty-six years, widow. Entered hospital January 7, discharged May 10. Entered with a high temperature, incoercible vomiting and severe constipation. The enlarged

abdomen was filled by the spleen. This condition had lasted for six weeks.

The patient thought that her present state dated back six years, at which time the first paroxysms of malaria occurred. Since this time a very painful and hypertrophied spleen had been present.

The attacks of malaria were always accompanied by vomiting. The patient was very emaciated and anæmic. For the past two years the menses had not occurred.

From January 7 to February 17 the patient suffered from attacks of malaria of a very irregular type, often accompanied by vomiting, which had a fecal odor, and which led to the supposition that there might be a transitory intestinal occlusion due to compression of the spleen, which became very enlarged during the paroxysms.

Treatment: Injections of arsenic and quinine. From February 17 to March 17 the temperature remained normal and the patient felt fairly well. Faradization of the spleen was resorted to, but without result, and the patient requested operative treatment.

On March 17, an incision 19 centimetres long was made in the median line. There were many adhesions between the intestine and other abdominal viscera, which were partly destroyed by the fingers and partly divided between ligatures. Tough adhesions existed between the spleen and diaphragm.

After removal, the spleen was found to weigh 2650 grammes. Its surface was smooth over certain areas, while at others a layer of cartilaginous layer existed.

The patient did perfectly well after the operation until March 19, when malarial attacks occurred, which gave way to quinine, and the patient was discharged well on May 10.

The spleen will often be found surrounded by a fibrinous exudate, which becomes organized and produces adhesions between the spleen and surrounding viscera, peritoneum, diaphragm, intestine, and even the liver and pelvic viscera. These adhesions, which are more or less tough and numerous, occasionally offer an insurmountable obstacle to the accomplishment of splenectomy.

If adhesions with the surrounding structures do not exist, the hypertrophied spleen, on account of its weight, distends its ligaments, becomes movable and leaves its bed. Its pedicle becomes elongated, twists on account of the mobility of the organ and necrosis is the

natural outcome. Necrosis may likewise be caused by thromboses of the vessels and the formation of infarcts.

Some rare cases of amyloid degeneration of the spleen have been met with following malarial cachexia. But what characterizes the hypertrophic spleen of malaria is its excessive friability, so that even a slight trauma is quite enough to cause its rupture, resulting in fatal hemorrhage. Or the result may be the formation of hematoma or hemorrhagic cysts which suppurate easily.

The clinical picture of malarial splenomegalia varies greatly according to the size of the organ, the extent of the adhesions and the degree of cachexia.

According to Sakharoff, the hypertrophy *per se,* when not complicated by perisplenitis or cachexia, does not trouble the patient, and may even remain unnoticed, even when the organ has attained very large dimensions. When there is no perisplenitis, the splenic tenderness, which is very marked at the onset of the disease, progressively diminishes and finally disappears completely.

Things transpire quite differently in splenomegalia complicated by repeated attacks of perisplenitis and cachexia. Such patients are sallow, the mucosæ are pale; the swollen face expresses apathy and suffering, there is œdema of the limbs and the abdomen prominent. The voice is weak and there is dyspnœa upon the slightest exertion; respiration is short and superficial, and the patient instinctively protects his abdomen against any possible trauma. The erect position cannot be maintained for any length of time, and frequently these patients are obliged to remain in bed.

The principal symptoms of .which the patient complains are: Pain, dyspnœa, vomiting, diarrhœa or constipation, frequent desire to urinate, gingival hemorrhages, epistaxis, hemoptysis and renal hemorrhage.

In women, the menses become irregular, or they may be too profuse and accompanied by pain, or they may be missed for several months.

Auscultation reveals anæmic souffles; the lungs may be intact or on the other hand offer some bronchial râles. The temperature is normal or even slightly subnormal, which indicates a reduced nutrition. On the contrary, sometimes irregular rises will be noted, caused

either by repeated malarial paroxysms or from complications arising in some of the viscera.

The abdomen is enormous, and if there is no ascites the hard, hypertrophied spleen can be easily felt on palpation lying closely in contact with the anterior abdominal parietes. The general shape of the organ is retained and the anterior border offers deep clefts. The organ is usually more or less mobile, the degree of the mobility depending upon the brevity of the splenic ligaments and the extent and arrangement of the adhesions in relation to other viscera. If perisplenitis is very pronounced one may sometimes perceive a peritoneal friction sound when the organ becomes displaced.

There is a uniform percussion dullness over the entire extent of the tumor. The intestinal loops pushed upwards and to the right are hardly ever found between the abdominal parietes and the spleen.

Two kinds of pain may be distinguished. One kind is sharp, intermittent and depends upon the exacerbations of the perisplenitis. The others, by their character, recall neuralgia pains and oblige the patient to keep his bed. These pains start in the left hypochondrium and extend to the shoulder, abdomen, lumbar region and pelvis.

After a few days the symptoms of acute perisplenitis gradually disappear, but it may happen that the inflammation, by extending from the capsule to the peritoneum, provokes a partial or generalized peritonitis.

There are yet other pains, less severe, but continuous, due to adhesions of the spleen with the surrounding structures. The slightest movement on the patient's part causes these adhesions to pull upon various viscera, irritating them and disturbing their functions. Adhesions with the diaphragm are the most common and also the most unpleasant for the patient.

This constant dragging on the diaphragm increases the already existing dyspnœa, caused by the forcing up of the diaphragmic dome by the enlarged spleen. Pressure and dragging of the stomach provoke gastralgia and rebellious vomiting, while adhesion with intestinal loops may result in occlusion.

The bladder reacts to the irritation by frequent desire to urinate, while pressure and adhesions with the pelvic organs in the female produce uterine displacements and miscarriage and other complications. In malarial subjects the liver often takes part in the cirrhotic

process, causing ascites, which aggravates the general poor condition of the patient. The kidneys also are badly influenced by malaria. The kidneys also are acted upon by malaria, acute and chronic nephritis, also hemorrhagic nephritis, is frequently observed.

Nervous complications occasionally arise, and it can be said that there is not a single organ which may not participate in the general clinical picture.

All this produces and keeps up cachexia, and death is the outcome. The differential diagnosis of simple and splenomegalia is easy, because the spleen retains its shape and is quite superficial in location. It will only be difficult when there is much ascites, but removal of the fluid will reveal the true nature of the condition.

The usual treatment is the exhibition of quinine and arsenic in all its forms, old and new, and faradization. These therapeutic measures which cause the spleen to contract when in the hyperemic phase, are naturally without result when the organ has become sclerosed. Then the only means at our disposal for helping the patient is to remove the spleen, which, on account of the profound morbid changes of its parenchyma, has ceased to functionate normally and has become transformed into a true tumor.

To all the difficulties that may confront the surgeon in these operations is to be added the fact that the patient is malarial, that these subjects often suffer from hæmophilia, they are very sensitive to infection, especially the streptococcus, their wounds suppurate easily and often become necrotic. Finally, any kind of trauma, operative or otherwise, may awaken an old malarial infection which had become latent.

In order to avoid these eventualities, Professor Ajanassieff advises the prolonged exhibition of anti-malarial medication before resorting to operation, and this is all the more logical, because spleens which had been hypertrophied for a long time have been known to become reduced in size after a medical treatment regularly carried out.

In cases of hypertrophied spleen when the organ is not movable, three operative procedures have been resorted to, viz.: splenectomy, ligature of the splenic artery in order to produce a progressive atrophy of the organ, and exosplenopexia. The latter operation has been essayed when splenectomy could not be carried out.

The early operations for removal of the spleen gave a very high

mortality, as might be expected, but this has been greatly improved during the past twenty-five years. I take at random some of the early statistics. In 1881, Vanverts found a mortality of 83.3 per cent.; Adelmann, in 1887, 70 per cent.; Iakovleff, in 1893, 61 per cent.; Bessel-Hagen, in 1900, 38.3 per cent.; Beresnegovsky, in 1900, 32 per cent.

Three conditions are absolutely essential for success in splenectomy, namely: (1) The patient's general state of health must be satisfactory; (2) the size of the spleen must not be excessive, and (3) the organ must be mobile or can be rendered so. Unfortunately, these conditions are almost never realized in malarial subjects, and from the very beginning of the operation the operator will encounter difficulties even in the narcosis.

Often it will be found imprudent to administer either chloroform or ether to malarial subjects, because the heart and lungs are in bad condition. Thus in one case local anæsthesia following Schleich's method was resorted to.

CASE III.—Female, æt. thirty-eight years, entered hospital March 28. Father died at the age of fifty from an infectious disease and had previously suffered from a chronic gastritis. Two younger sisters are in good health.

At the age of ten years the patient had measles and then remained well until the age of eighteen years. Menstruated at seventeen years, always regular until within two to three years ago, when an irregular amenorrhœa appeared. When she was ten her family moved to a very malarial district, and there, during the first two or three years of her stay, the patient had attacks of malaria, occurring either daily or every second day.

Married at the age of twenty-two; has had nine children. The first eight pregnancies and labors were normal, but the last, one year ago, resulted in a premature birth for no known reason. The child was dead.

About fifteen years ago the patient discovered a tumor in the abdomen, which slowly increased in size until it finally almost completely filled the left side from the costal border to the pelvis. The tumor was movable, and at times seemed to diminish in size and to suddenly increase again at the time of attacks of malaria and during gestation, at which times it would become displaced upwards and to

the left and remain immovable. It was not painful on pressure, but from time to time the patient experienced spontaneous pain sufficiently severe to keep her in bed.

One evening, about four years ago, after a day of unusually hard work, the patient had very severe pain in the region of the tumor, which obliged her to remain in bed for several days. At the same time she noticed that a second tumor, round in shape, had developed on the primary growth. After a week in bed she was able to get up and resume her work.

But from this time on the spontaneous pain recurred more frequently, the abdomen increased in size and the patient became weak. She then decided to enter hospital.

Status præsens on March 23: The patient was a large, well-built woman, very emaciated and anæmic. The integuments were pale and dark yellow in hue. Lungs normal. Anæmic murmur over cardiac area. Liver normal on both palpation and percussion. Kidneys and bladder normal. Uterus somewhat enlarged, painless. Amenorrhœa for the past five weeks from probable pregnancy. Adnexa normal. Temperature normal; pulse weak and irregular.

The patient complained of the size of her abdomen and of severe pain, which became worse from time to time. She felt very weak.

Local status: By inspection, the abdomen was seen to be considerably enlarged; the right side markedly protruded. The abdominal parietes were thin and relaxed. By palpation a large lobulated tumor could be detected to the *right* of the linea alba, it was movable and could be pushed up under the left ribs, but would immediately fall over to the right side when pressure was removed.

The tumor offered two parts. The left was ellipsoidal, smooth, elastic, resistant, and fixed by a broad pedicle to the second tumor, which was a little longer, but somewhat flatter than the first, and presented two deep notches on its anterior border.

The entire tumor occupied the region between the linea alba and the right anterior axillary line, and extended from the sternum to the iliac crest. It was not painful on pressure and was in no way connected with either the uterus or liver.

Splenic dullness was absent on percussion. Dullness over the entire area of the tumor and intestinal tympany occupied the entire left flank.

Differential diagnosis: The attacks of malaria for eighteen years, a normal liver, absence of relationship of tumor to uterus, absence of splenic dullness, the shape of the tumor with two notches on its anterior border were all in favor of a splenic tumor arising from repeated trauma in a malarial hypertrophied spleen.

Operation, March 29. On account of the very great weakness, general narcosis was discarded and local anæsthesia by Schleich's infiltration method was resorted to.

An incision, 20 centimetres long, was made along the external border of the left rectus muscle. The posterior aspect of the tumor was bound to the peritoneum by adhesions, which were easily broken up with the finger. The vessels of the splenic hilum (for the tumor was the spleen) were ligated separately and then *en masse*. After removal of the spleen, the abdominal incision was closed in three layers.

There were no post-operative complications. Healing by first intention. Sutures removed on the eleventh day. Patient discharged on sixteenth day following the operation.

The patient was seen on July 2, when it was found that she had recovered her health and was in the fifth month of pregnancy. Abdominal wound perfect. There were lymph-nodes over both sterno-mastoids about the size of a pea.

The removed spleen with the tumor weighed 1700 grammes, it measured 19 cm. × 9 cm. × 8.5 cm. Two deep notches were present on its anterior border.

The capsule of the tumor was smooth, from 2 to 3 millimetres thick, and mottled in color, recalling a section of the lung. Two adhesions on its posterior surface bound it to the peritoneum.

On section, the capsule was found surrounding a brownish-red spongy mass, whose centre was filled by a colloidal mass. Microscopically, the mass was composed of transformed fibrin. The splenic parenchyma was not changed, only hypertrophied.

The contra-indications for splenectomy are: (1) a very pronounced cachexia; (2) leucæmia; (3) an undue size of the spleen, and (4) insufficient mobility of the organ, due to extensive adhesions.

Vanverts and Jonnesco are of the opinion that only the most severe forms of cachexia make splenectomy impossible, because (they say) even in cases where the general state of health is very bad, a favorable outcome may often be obtained.

Among the more serious *complications* I would mention ascites and cirrhosis of the liver; the mortality in these cases is about 75 per cent.

Very dangerous are cachexias complicated by hæmophilia. The cachexia brings about hydræmia and friability of the vessels and increases the permeability of their walls. During operation, the hæmophilia gives rise to formidable oozing, which is very difficult to control. Not only does the blood flow from the incision, but from the adhesions as well. Long ago, Verneuil pointed out that the hæmophilia of malarial subjects was a direct contra-indication for any surgical interference on them.

Leucæmia occasionally is associated with malaria, but the question of the reciprocal relations of these two affections has not yet been made clear. True leucæmia, contrary to simple hyperleucocytosis—which is not a contra-indication to operation—is an absolute obstacle to operation.

The enormous size of the spleen may make its liberation and ligature of the pedicle a very difficult matter. A very hypertrophied organ may contain as much as two litres of blood or even more, and the sudden abstraction of so large an amount of blood from the general circulation is certainly not without danger.

The large number and rich vascularization of the adhesions are a most absolute contra-indication for splenectomy, because on division they may give rise to fatal hemorrhage. Besides, long manipulations are prone to produce shock. It is often very difficult, sometimes even impossible, to foresee the presence of adhesions. The relative immobility of the spleen or repeated attacks of perisplenitis should always lead one to suspect extensive adhesions. But this is only true to a certain point, because the immobility of the organ may be due to its undue size and short, inelastic ligaments, and adhesions may be completely absent.

In other cases, as in the following, the spleen may appear to be mobile, even when there are very extensive adhesions.

CASE IV.—Female, æt. twenty-one years, single. Entered hospital March 15, died April 13.

Had suffered greatly from malaria. About five years ago a large abdominal tumor developed which prevented the patient from doing

any work. Anæmia, epistaxis, yellow skin, dyspnœa. Amenorrhœa for the past four years.

Almost the entire abdomen was occupied by a large tumor (probably the spleen), hard and lobulated, reaching down to the pubis. It was movable. No friction sounds when tumor was moved.

Constipation. Râles in the lower pulmonary lobes. Free glairy expectoration. Frequent desire to urinate. No albumin. Temperature normal.

From March 15 to April 13, the patient was treated with quinine and arsenic, and during this time had several epistaxis.

Operation, April 13. Median incision 22 centimetres long.

The spleen was found very adherent to the omentum; the adhesions being arranged in layers. To destroy them, it required two hours with fingers, scissors and thermocautery. It seemed as if they were not very considerable, and it was this fact that caused Doctor Meerovitch to continue the operation instead of closing the abdomen. The entire operation took three hours.

Although there was no collapse during the operation, the patient died five hours afterwards from shock.

Autopsy. The abdominal cavity contained from two to three glasses of fibrous exudate distinctly bloody; no clots. The spleen weighed 2640 grammes. Microscopically there was much connective-tissue in the parenchyma.

Exploratory laparotomy is sometimes the only means to ascertain the exact condition of affairs. When it reveals extensive adhesions and especially a marked friability of the spleen, it is more prudent to abstain from further manipulations and close the abdomen. Exploratory laparotomy has been known to occasionally improve the patient's condition, and even some cures have been reported following it.

The age of the patient, excepting the extremes of life, has no particular influence on the issue of the operation. Pregnancy is not a contra-indication to splenectomy. Case III was five weeks pregnant at the time of the operation and went to term, and I have notes of another case which was favorable. Other operators have met with the same experience.

CASE V.—Married woman, æt. twenty-seven years. Entered hospital February 22, discharged March 22.

Patient has been ill for several years. Up to within two years has had paroxysms of malaria upon several occasions.

By palpation, an enormous tumor could be felt, extending to the middle line and below to the pubis. The patient micturates and vomits frequently. Complains of colicky pain over the tumor, which is merely an hypertrophied spleen. Temperature normal. Patient three months pregnant.

Operation, February 26. Spinal anæsthesia, with a 4 per cent. eucaine solution. Five minutes later the pulse was 80, the respirations 28, just as before the injection. Operation begun ten minutes after the injection. Anæsthesia of abdomen complete from costal border to perineum and lower limbs. Pulse 100, respirations 28.

Twenty-five minutes later, pulse 88, respirations 26. Nausea occurred thirty-five minutes after the injection, and forty minutes after the pulse was 64, respirations 26. Operation was completed in ninety minutes. A quarter of an hour after the anæsthesia disappeared.

The incision was made on the left side of the left rectus muscle. The splenic vessels were ligated and the spleen almost entirely removed, only a piece the size of half a hen's egg being left at a point where the spleen was very adherent. The splenic stump was covered by peritoneum and the abdomen closed.

Patient made an uninterrupted convalescence and was discharged on March 22. The pregnancy continued normally.

Given the difficulties offered by *splenectomy* in malarial hypertrophy of the spleen, Jonnesco has been led to divide these cases into three groups, viz.: (1) fixed spleen; (2) movable spleen, and (3) ectopic spleen. I shall refer in more detail to ectopic spleen later on.

Jonnesco calls a fixed spleen one which has maintained its normal relationship with the left hypochondrium and retained in this position by short, strong ligaments. There is no displacement, and the lower border of the organ alone descends into the abdominal cavity. The spleen cannot be moved by manual manipulation.

In these circumstances, an operation offers many difficulties on account of the shortness of the ligaments.

The movable spleen has only apparently preserved its normal relationship with the hypochondrium. In reality, its ligaments are more or less stretched, and in this case the organ is mobile in the

horizontal and vertical directions. The relatively considerable length of the ligaments makes them more accessible.

Both the fixed and movable spleen may become complicated by the formation of adhesions.

The *technique of splenectomy* is as follows: The incision may be made in the middle line or along the external border of the left rectus muscle. Fevrier and Jonnesco prefer the median incision, because they believe that it offers a wider field of operation and an easier access to the splenic pedicle. Mikhailowsky, on the contrary, believes that the left lateral incision is better, because the approach to the adhesions is shorter. Whichever incision is used, it should be at least 20 centimetres or more, and if this does not give enough working space a transversal incision may be added.

Considerable bleeding from the skin incision should always attract the operator, because it indicates hæmophilia or the presence of numerous adhesions with anterior abdominal wall. The hemorrhage may appear or increase after ligature of the splenic artery, because this causes a sudden increase of the blood-pressure.

The second step is to free the spleen. The organ should be explored with the hand in all directions, and if the adhesions are few and lax, they may be broken with the hand. The removal of the spleen is then proceeded with, bringing out its lower pole first. If the organ is not very large, if the pedicle is sufficiently long and if there are no adhesions, this part of the operation is easy.

The size of the spleen may create serious difficulties to its extraction when the lower border extends very far downwards or when the incision is insufficient in length. But if the organ is strongly adherent to the surrounding viscera, the technique becomes a complicated matter. Adhesions with the omentum being particularly rich in large-sized vessels, they must be divided between ligatures. Adhesions with the abdominal viscera, although making the operation longer, are not as dangerous as those binding the spleen in the hypochondriac fossa. The latter may be so dense that they form a kind of abdomino-splenic symphysis, to use Jonnesco's words.

Adhesions with the diaphragm are the most dangerous of all, as they give rise to hemorrhage difficult to control on account of the deepness of the field, and separating them provokes shock by irritation of the diaphragm and exposes the latter to tears, as occurred in

two of Jonnesco's cases. All this obliges the operator to sometimes leave a bit of the spleen behind, which is not without serious inconvenience. One is obliged to suture this splenic stump, and the sutures cut through the splenic tissue with ease on account of its great friability, as occurred in the following case:

CASE VI.—Female, æt. thirty-five years, married. Entered hospital November 19, died December 16.

Has suffered from malaria for ten years past. Pain in the abdomen with a feeling of weight. Heart and lungs normal. The enlarged, hard spleen extends to the middle line and below to four fingers' breadth above the umbilicus. There was a little ascites. Small amount of albumin in urine. Temperature normal.

Operation, December 15. Chloroform narcosis. Incision 16 centimetres along the left rectus muscle, which immediately revealed a very large spleen under the peritoneum. During the feeling out of the spleen some large vessels were torn. Hemorrhage controlled by ligatures. A portion of the spleen only can be removed and the parenchymatous stump was sutured. In the evening the pulse became bad and the patient died the following morning.

Autopsy showed an internal hemorrhage from the sutured splenic stump; the sutures had cut through, but all the ligatures had held.

The normal phrenosplenic ligament, which is rather lax and not very vascular, can be separated with the hand without first applying ligatures, but should it perchance have large vessels, it must be divided between ligatures. In the so-called fixed spleen this ligament is so short that its separation becomes a complicated matter.

Shock often occurs during splenectomy on account of dragging on the phreno-splenic ligament, the proximity of the solar plexus having much to do in its production. In order to avoid this, Shanton advises to begin, when this is possible, to divide this ligament before bringing the spleen out of the abdominal incision.

Among the complications which may arise during extraction is rupture of the spleen or large vessels, as in Case I.

The third step is ligature of the pedicle, which is easy when the pedicle is long, and very difficult when it is short and deeply seated, as occurs in fixed spleen. Usually the vessels are ligated separately and then *en masse*. It is not necessary to separate the nerves, and

should the tail of the pancreas be mixed up with the ligament, it is usually tied off with the vessels. Herczel has pointed out the dangers of including the tail of the pancreas in the ligature, attributing post-operative complications, such as necrosis of the cellular tissue and hyperæmia, to pancreatic lesions.

When the hypertrophied spleen lies in close contact with the greater curvature of the stomach, ligature of the splenic pedicle is particularly difficult, and great attention must be paid not to comprise the gastric wall in the ligature.

The fourth step is the inspection of the splenic fossa, which should invariably be carefully made, because hemorrhage, no matter how trifling, if not attended to may become serious. The slightest oozing should be controlled by hemostats, thermocautery or gauze packing.

Death after splenectomy usually is due to either hemorrhage or shock, or both combined.

The most frequent and dangerous post-operative complications are: reflex pulmonary congestion, as in Case I; pneumonia or left-sided pleurisy, as in the following case:

CASE VII.—Married woman, æt. thirty years, entered hospital May 7, discharged June 1.

Patient has been ill for seven years. Has had malaria. The splenic tumor extends downwards to the symphysis pubis and 1 centimetre to the right of the median line.

Patient complains of pain. General condition good. Temperature normal.

Operation, May 10. Chloroform narcosis. Median incision. Over its entire surface the spleen is adherent to the omentum, diaphragm, abdominal wall and descending colon. Many adhesions had to be divided. A piece of the spleen the size of a hen's egg adherent to the diaphragm was left. This was sutured with four sutures and then covered by peritoneum. The portion of the removed spleen weighed 2854 grammes.

A left-sided pleurisy was discovered on the next day, but by May 26 the temperature had become normal and the patient was discharged on June 1.

On account of predisposition peculiar to malarial patients, a streptococcic infection, septicæmia or purulent peritonitis may occur.

Case VIII.—Married woman, æt. thirty-two years. Entered hospital March 29, died April 7.

Patient has had malaria. Complained of abdominal pain and great lassitude. The spleen is enlarged, extending to the mid-line and down to the iliac crest.

Operation, April 4. A portion of the spleen removed.

Died on April 7 from purulent peritonitis.

Occasionally death occurs from late secondary hemorrhage from slipping of one of the numerous ligatures or a too rapid absorption of a thrombus. One of my cases died seven days after splenectomy from internal hemorrhage, the ligatures having given way during a paroxysm of coughing.

Case IX.—Married woman, æt. fifty-two years, entered hospital August 29, died September 9.

Patient ill for two years. Feeling of weight in the abdomen, difficulty in walking. Circumference of abdomen at level of umbilicus when standing, 1 metre 3 centimetres. Ascites, a large tumor, slightly movable, extending from the left hyperchondrium to the pubis. Its shape recalls a malarial spleen. Temperature normal.

Operation, September 2. Chloroform narcosis. Incision from xiphoid appendix to pubis. Splenectomy.

Temperature on days following operation normal and general condition good. Began to cough on September 5, three days after operation. On September 9, pulse suddenly dropped, the abdomen became distended and the patient died.

Autopsy showed an intra-abdominal hemorrhage from the giving way of a ligature.

In malarial subjects, wounds sometimes are slow in repair and occasionally the abdominal incision will break down. Therefore, the sutures should not be removed too soon.

During the post-operative period the temperature may remain perfectly normal, but if there is hyperthermy it will be due to an infection, pulmonary complication, a local inflammatory process in the stump of the pedicle and occasionally to a simple return of the malarial manifestations.

Splenectomy will not cure the malaria, and the affection commonly returns after removal of the hypertrophied spleen. Such was the case in Case II and in the two following cases:

CASE X.—Married woman, æt. twenty-five years, entered hospital May 8, discharged June 21.

Patient has had malaria for five years. Complains of pain in abdomen on the left side. Heart and lungs negative.

By palpation a tumor can be detected in the left side of the abdomen which extends down to the pubis. On the right, the tumor extends beyond the median line to the extent of 2 centimetres. A notch can be felt on its upper aspect.

Micturition good; temperature normal. Pain complained of in the area of the tumor.

Operation, May 17. Spinal anæsthesia with solution of eucaine at 2.5 per cent. Injection made between the third and fourth lumbar vertebræ.

Incision in middle line and the spleen easily removed.

Sutures removed on June 4; union *per primam.*

On June 10, an attack of malaria occurred. Quinine exhibited; patient discharged well on June 21.

CASE XI.—Married woman, æt. forty-two years, entered hospital May 20, discharged June 11.

Father died at the age of sixty years from an acute affection; had always been strong and in good health. Her mother, who had always been well, died suddenly on the day her husband was buried. There were five brothers, three of whom are well, the other two died in childhood.

The patient does not recollect any diseases during her childhood. Menses began at the age of fifteen and were always regular until three years ago, when the patient commenced having irregular amenorrhœa and leucorrhœa.

Married at the age of twenty; has had eleven children; the gestations and labors were normal. Eighteen months ago had a miscarriage after lifting some heavy objects.

Fifteen years ago the patient moved to a malarial district and developed frequent paroxysms of the disease. Thirteen years ago she noticed a very movable tumor in the abdomen; it was not painful to pressure, but was painful during the paroxysms of malaria; from time to time the tumor gave rise to rather acute spontaneous pain.

The last five pregnancies occurred after the appearance of the

Day of Month															
Day of Disease															

Poids T.

41,°

40,°

39,°

38,°

37,°

36,°

35,°

34,°

Name **A. W.**   *Case* XV

Day of Month																					
Day of Disease																					

Poids *T.*

41.°

40.°

39.°

38.°

37.°

36.°

35.°

34.°

Operation

Cough

abdomnal pain

1st function

death
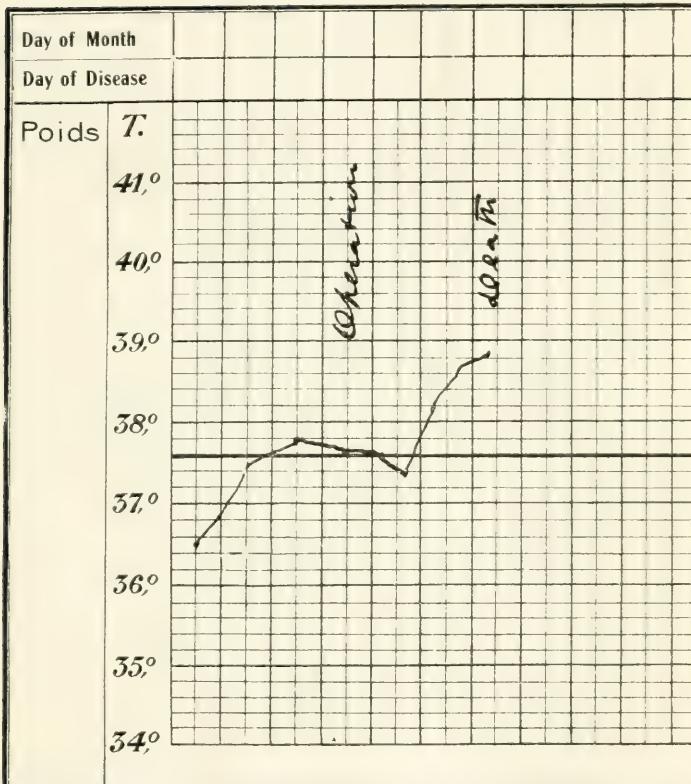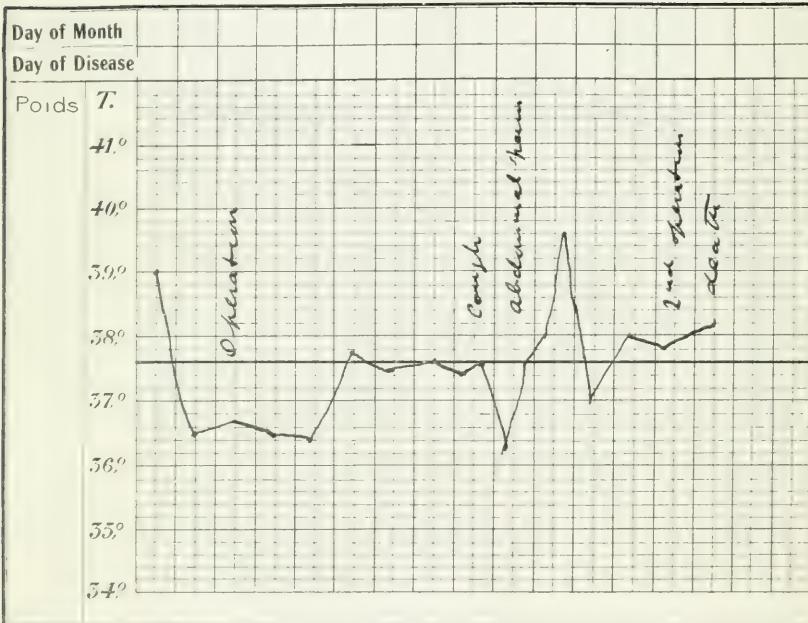
tumor. The latter became displaced upwards and to the left by the pregnant uterus.

Seven years ago while the husband was drunk, he struck the patient's abdomen with the fist and for several days afterward the patient complained of pain in the tumor, which gradually subsided, but a second tumor was found to have developed on the first.

Upon examination, the patient, a woman of medium size, was found anæmic and the skeleton well developed. She complained of pain in the left flank, walks with difficulty, and cannot work. Pulse, 70; temperature, 37° C. (98.6° F.). Liver normal; no renal symptoms. Uterus movable, retroverted; leucorrhœa; adnexa normal. Constipation; occasional digestive disturbances.

Upon inspection the abdomen was wallet-shaped, the left side projecting considerably. The abdominal wall was relaxed and a movable tumor could be felt in the left hypochondrium, which could be displaced downwards to the pelvis and to the right as far as the linea alba. The shape of the tumor was that of the spleen, it being elongated (about 15 centimetres) and offered a deep notch on its anterior border. At the middle of its external aspect a second, rounded tumor could be felt; this was the size of a closed fist, painless and rather hard. On percussion there was absence of splenic dullness, but the entire area of the tumor was dull.

Operation, May 26. Chloroform narcosis. Incision along the external border of the right rectus from the ribs to three fingers' breadth below the umbilicus.

The tumor was found to be the spleen with a rounded sessile tumor having a thick white wall, resembling an echinococcus cyst.

As the tumor could not be excised alone, and as the spleen was floating, splenectomy was done. The large vessels of the splenic hilum were ligated and the spleen almost completely removed, leaving only a bit of the organ the size of a hen's egg. Hemorrhage was trifling. Abdominal incision closed in three layers.

The post-operative period was perfect, the sutures being removed on the tenth day. The patient was discharged on June 11.

Seen on June 28, she was still anæmic. The lymph-nodes were not increased in size. After leaving the hospital the patient had several attacks of malaria, which disappeared by the exhibition of quinine.

Examination of the tumor. On the external aspect of the spleen,

at its lower third, is a bosselated growth the size of an adult fist. The combined weight of the spleen and neoplasm was 640 grammes. The greater circumference measured 28.5 centimetres, the lesser 25 centimetres. The circumference of the pedicle of the neoplasm was 14.1 centimetres. The spleen was hypertrophied and measured 14 centimetres in length.

On section, the splenic parenchyma did not offer any pathologic change excepting a hemorrhagic focus in the centre of the organ. The capsule of the neoplasm was white and measured from 3 to 5 millimetres in thickness; it was dense and easily stripped off. The contents were a dark-brown mass, superposed in concentric layers. The mass filled the entire cavity; the centre occupied the base of the neoplasm.

The capsule appeared to have pressed upon the contents and to have transformed its structure by producing concentric strata. The mass of the content consisted of transformed fibrin.

In still another case the adhesions were very extensive and the spleen could be completely removed, but the patient died of shock.

CASE XII.—Unmarried woman, æt. twenty years, entered hospital October 7, died October 10.

Patient had been ill for three years. The hypertrophied spleen occupies principally the left side of the abdomen. It is irregular in shape. The lower left portion of the tumor projects strongly forwards and hinders the patient greatly in her work. The patient has had malaria. Anæmia pronounced. Temperature normal.

Operation, October 9. Chloroform narcosis. Median incision. Spleen very adherent to the intestine and omentum. It required one hour to separate the adhesions, ligatures were necessary, but there was very little loss of blood. The removed spleen weighed 2200 grammes and contained much connective-tissue.

The patient regained consciousness after the operation, but the pulse became weak. Complained of feeling cold and then hot. Temperature 38° C. (100.6° F.). Twelve hours later the pulse again became weak and the patient lost consciousness and died in thirty minutes.

Autopsy showed that the abdominal cavity was perfectly dry. Ligatures held perfectly.

As I have said, the presence of ascites is always bad, as in Cases VI and IX. The following is another example:

CASE XIII.—Married woman, æt. forty-three years, entered hospital February 4, died February 8.

Patient has been ill for eighteen months. Abdomen enlarged; ascites; spleen hard, greatly enlarged, painless. Organs of generation normal. Poor general nutrition. Temperature irregular 37° C. (98.6° F.), 39.5° C. (103.5° F.), 38° C. (100.6° F.).

Operation, February 7. Ether narcosis. Splenectomy. Weight of spleen 1500 grammes.

Patient died the following day.

If the patient survives the splenectomy, recovery is usually rapid and complete, the cachexia soon disappearing. Many cases return to flourishing health and all the organic functions become normal.

Splenectomy exercises no influence on the growth and development of young subjects, and the same may be said of pregnancy and labor. This complete recuperation of health may perhaps be due to removal of the spleen, but this is still a mooted question. What is certain is that these patients become healthy, and it is rare that the physical weakness, emaciation, abdominal pain and psychoses do not quickly disappear.

Certain tissue changes do occur, such as a change in the composition of the blood, a temporary tumefaction of the lymph-nodes, hyperemia of the bone marrow, a decrease of the urotoxins, and, in very exceptional cases, hypertrophy of the thyroid gland.

The blood changes consist of an increase of the white cells, a quantitative decrease of the red blood-corpuscles and hæmoglobin. There is no constant ratio between the white and red cells, as it varies from 1 to 200 to 1 to 50. All depends upon the case. These changes last from several weeks to several years.

The number of red blood-corpuscles diminishes after splenectomy to the extent of from 15 per cent. to 17 per cent., after which it rapidly increases so that a month after the operation it will have reached to with 1 per cent. below the average. By the end of a year it will have gone beyond that present at the time of the operation.

The white corpuscles decrease during the first few days following splenectomy, and then increase 30 per cent. to 60 per cent. above the average. This hyperleucocytosis disappears at the end of one or two

years and usually concerns all the types of white cells. Exceptionally the number of lymphocytes increases in a larger proportion than that of the polynuclears. Towards the end of the second year a late eosinophilia may be noted, according to Kourloff. The hæmoglobin falls from 17 per cent. to 20 per cent. after removal of the spleen, after which it gradually increases during the first year.

The hypertrophy of the lymph-nodes is not a constant phenomenon. Usually, it is the axillary and inguinal glands which are involved. Their enlargement appears about the fifth to the sixth day after splenectomy, and a few weeks later retrogression begins. They reach the size of a pea or bean, are hard and sometimes painful.

The bone marrow assumes the characters of the embryonal type. Finally, after splenectomy, a diminution of the urinary toxicity is observed, the causes of which are as yet obscure. Emelianoff thinks that the lymph-nodes and bone marrow fulfil the hæmopoietic functions of Malpighi's corpuscles after splenectomy, but this is only a supposition.

Considering the dangers offered to splenectomy when extensive adhesions exist, certain operators have endeavored to reduce the size of the hypertrophied spleen by ligation of the splenic vessels in order to bring about atrophy of the organ. The procedure was first undertaken by Clement Lucas, in 1882. However, the animal experiments of Balaesco and Brückner have shown that ligature of the splenic pedicle *en masse* rapidly results in necrosis of the organ, but ligature of the larger part of the vessels brings about atrophy, followed by cirrhosis.

Ligature of the splenic artery alone causes a slight and gradual atrophy of the gland, which does not permanently destroy its functions. If there are a large number of vascular adhesions, necrosis will not occur even after the ligature of several large vessels, because the vascular supply coming from the adhesions is sufficient to nourish the spleen, which gradually atrophies from cutting off its principal blood supply.

Ligature of the splenic artery of a normal spleen is both easy and simple, but when the organ is hypertrophied and adherent the difficulties are great. Numerous bands of adhesions hinder the approach to the pedicle, while an undue brevity of the latter will render the operation impossible, as occurred in Campenon's case.

Up to the present, ligature of the splenic artery to produce splenic atrophy in cases of malaria has only been rarely done. It was done by Wyman, in 1889, but the patient died of peritonitis two days later. One year previously, in 1898, Meerovitch resorted to this procedure, but the spleen remained hypertrophied. Here are the notes of the case which have not been published:

CASE XIV.—Widow, æt. thirty-eight years, entered hospital September 19, discharged December 8.

Patient has been ill for five years. Has had malaria. A hard, smooth, movable hypertrophied spleen occupied the left side of the abdomen and reached one finger's breadth below the costal border. The patient was anæmic. Nothing in the lungs; heart sounds normal. Temperature normal.

Operation, September 22. Median incision, 15 centimetres long. Splenic artery recognized by the finger. It was freed from the other vessels and ligated.

The temperature remained normal during the entire convalescence. On the third day intestinal colic and diarrhœa occurred and lasted four days.

The spleen was subjected to faradization and cold douching, but it remained hypertrophied at the time of the patient's discharge on December 8.

Exosplenopexy might possibly replace splenectomy in certain cases of malarial spleen, but this procedure has not been studied sufficiently so that its value cannot be as yet estimated.

Ectopy of the malarial spleen is less frequently met with than simple splenomegalia. An ectopic spleen is a spleen which, after having stretched its ligaments, leaves its fossa in the left hypochondrium and descends into the abdominal cavity.

Two etiological factors are simultaneously at work in the production of ectopy, viz.: the hypertrophy of the gland and stretching of its suspensory ligaments. The normal spleen is held *in situ* by strong ligaments, sufficiently so to bear the weight of an organ ten times heavier, but the phreno-splenic ligament bears the principal brunt in maintaining the organ in its anatomical position. The gastro-splenic and pancreatico-splenic ligaments hardly play any part in its fixation.

Darfeuille's experiments showed that a normal phreno-splenic ligament can support a weight of 3500 grammes, and the gastro-splenic

ligament 2500 grammes. Now, an ectopic spleen does not usually weigh more than 1 kilogramme, and more likely will weigh from 300 to 900 grammes; the maximum weight is from 2500 to 2700 grammes.

I have already pointed out that a spleen may weigh 3 or 4 kilogrammes without being ectopic; therefore, the weight of the organ alone is not the cause of ectopy, and it is essential that the ligaments lose their normal elasticity for this to take place. It is probable that the same morbid process which produces the splenic hypertrophy acts on the tissues of the ligaments.

Klob's researches show that the phreno-splenic ligament becomes atrophied and ruptures; the gastro-splenic and pancreato-splenic ligaments—being dragged on by the splenic ptosis—become stretched and form the pedicle.

The ectopic spleen is met with almost exclusively in women, the principal causes being repeated pregnancies, which produce a loss of tonicity of the abdominal parietes.

After it has left its fossa, the spleen may occupy any position within the abdomen, even the pelvis. So long as adhesions do not develop, the organ becomes displaced with the body movements, and by palpation it can be moved in any direction. But later on it loses its mobility and becomes fixed to the surrounding structures from an adhesive peritonitis.

The clinical picture of a movable spleen is very variable. If there are adhesions and if the organ is very hypertrophied, it provokes the same symptoms and functional disturbances as a fixed hypertrophied spleen, while its influence on the general health is about the same. The only difference is that, in this case, certain morbid phenomena are more marked. Thus, the symptoms of gastric irritation are more frequent and pronounced, because the gastro-splenic ligament drags on the stomach, and the organ becomes in turn displaced; and from these displacements an ectopic spleen produces intestinal occlusion more frequently by compression or strangulation of a loop of gut between the splenic pedicle and spine.

Torsion of the pedicle is the most frequent complication, and at the same time the most dangerous one of ectopic spleen. According to Liffering, it is met with in 20 per cent. of all cases, but probably this percentage is below the reality, and that less marked cases are

much more frequent. The torsion varies between 90° to three complete twists, and usually occurs from left to right and from above downwards, this mechanism being explained by the fact that after rupture of the phreno-splenic ligament, the upper lobe of the spleen, deprived of its attachment and being the heavier, slides inwards and downwards in the direction of the least resistance. During contractions of the stomach it is drawn in the same direction by the gastro-splenic ligament. Movements of the body and those of respiration all combine to make the spleen descend from left to right, and this is why the ectopic organ is so often found in the right iliac fossa.

From the influence of weight, the splenic ligaments slowly become elongated and thin, so that the organ is finally suspended by a long thin pedicle. In the midst of the mobile intestinal mass, the spleen continues its rotation from the movements of the body. Its pedicle, whose thickness varies from that of the little finger to that of the umbilical cord, may reach the length of 6 to 10 centimetres. It is composed of the gastro-splenic and pancreatico-splenic ligaments, vessels and the stretched tail of the pancreas. The latter and the vessels become twisted at the time when torsion takes place.

The lumen of the vessels is sometimes reduced to complete impermeability from thrombi, followed by endarteritis. The venous circulation being interfered with, a rapid engorgement of the spleen ensues, ending in hemorrhages in the parenchyma and under the capsule, which may cause rupture of the latter. The splenic parenchyma softens, infarcts form and necrosis takes place.

According to Jonnesco, the normal splenic tissue does not contain bacteria, and during the first twenty-four hours following torsion the necrosis is aseptic. But later, the bacteria emigrate from the intestine and stomach and moist gangrene of the spleen results. The surrounding peritoneum becomes inflamed and sets up adhesions between the various viscera, which may cause intestinal occlusion, as in the following case:

CASE XV.—Unmarried female, æt. thirty-nine years, entered hospital December 24, 1916, died January 11, 1917.

For some years the patient had presented a malarial splenic hyper-trophy, which caused her little disturbance, but two or three times a year there was abdominal pain lasting several days. Pronounced anæmia.

For the past week there had been severe abdominal pain, constipa-

tion, distention and vomiting.   Temperature 39° C. (102.5° F.).
On December 23, fecaloid vomiting.   Temperature 36.5° C.
(97.6° F.), pulse hardly perceptible.   Diagnosis—intestinal strangulation from adhesions of the spleen.

Operation, December 24.   Ether narcosis.   Median incision.   A
dark violet spleen was found lying transversely in the lower part of
the abdomen.   Its pedicle was surrounded by omentum, which had
pinched the left part of the transverse colon and upper part of the
descending colon.   After the omentum had been freed the vessels of
the pedicle were found twisted and filled with thrombi.   Splenectomy,
including the adherent portion of the omentum.

On December 29 there was abdominal pain, and on the next day
diarrhœa, distention.   These continued until January 10, when a
second laparotomy was done under a slight narcosis.

An incision was made on the external border of the left rectus.   A
hemorrhagic transudate was found in the abdomen.   The omentum
left after the first operation formed a large mass with soft adhesions
binding it to the transverse colon.   This omental mass was removed.

On the following day the exhaustion increased and the
patient died.

Usually, the onset of torsion is sudden; the symptoms appear following an effort or without any appreciable cause; pain of a severe
type, vomiting, weak pulse and pallor.   The temperature does not go
up.   At the same time the spleen increases in size from venous stasis.
The peritoneal symptoms and rapid enlargement of the spleen are
characteristic of complete torsion of the pedicle.   Finally, symptoms
of peritonitis develop, with vomiting, distension and a temperature of
38° to 40° C (101° to 104° F.), and if at the same time there is an
intestinal occlusion, the vomiting becomes fecal and no gas is passed
per rectum.   If the torsion is not complete and occurs gradually, all
the symptoms will be less marked and will disappear if the torsion
untwists spontaneously.

In a case of uncomplicated ectopic spleen, a tumor will be found
in the abdomen which, by its shape, recalls the spleen.   The pedicle
may occasionally be distinctly felt.   Splenic dullness is absent.   An
ectopic spleen might be mistaken for a movable kidney, but the shape
of the tumor and its position in front of the intestine should make the
diagnosis clear.   During the phase of acute pain it is impossible to
say whether or not torsion has occurred.

If the abdomen is painful and very distended, a diagnosis of torsion can only be made after narcosis or by exploratory incision.

If the malarial spleen is friable and greatly hypertrophied, the sutures will cut through the splenic tissues and makes the operation of splenopexy impossible, which has been resorted to when the spleen was not greatly enlarged and only slightly pathologically changed. But if adhesions are present, splenopexy is more dangerous than splenectomy. Finally, in the case of torsion, it is very risky and should not be considered. This is why Meerovitch modified this operation by combining it with removal of the spleen in the following case:

CASE XVI.—Widow, æt. fifty years. Entered hospital May 13, discharged June 15.

Patient complained of pain in the left hypochondrium. Had had malaria. The spleen, which was ten times larger than normal, had dropped down and could be easily displaced in the abdominal cavity. All the other viscera normal. Temperature normal.

Operation, May 22. Chloroform narcosis. Incision along left costal border. The spleen was lifted up towards the incision in order to bring out two-thirds of the organ. A rubber tube was applied to the spleen and a cuneiform excision of the organ was done above the pedicle thus formed. Ten sutures of stout silk were then passed through the edges of the incision and in those of the excised spleen. These were tied and the rubber tube removed. There was some oozing, which was controlled by sutures. Compressive dressing. The excised portion of the spleen weighed 800 grammes.

On June 3 some of the sutures were removed, the remainder on June 8. A hemorrhage took place, which was controlled by packing.

The remainder of the convalescence was normal, and the patient was discharged well on June 15, when the spleen was found solidly anchored, and the remaining portion of the organ (about one-third) had decreased in size.

The surest procedure for movable spleen is splenectomy. The ectopia makes it easy, as the spleen is more accessible, and on account of the elongation of the pedicle it is easily ligated. In these circumstances, the operation should not require more than ten or fifteen minutes. In uncomplicated cases of torsion the mortality is 8 per cent.

When adhesions are numerous, severe hemorrhage may occur, but the loss of blood is less than when the spleen is fixed. When the spleen is wedged in the true pelvis it is difficult to free it.

When torsion of the pedicle occurs, operation should be done before the symptoms of peritonitis supervene. Case XV offers a complete picture of this complication, with all its consequences. In this case it is probable that the patient had previously suffered from incomplete torsions from time to time, which had become untwisted spontaneously. When the patient entered the hospital she presented all the symptoms of peritonitis and intestinal occlusion.

The following case is interesting because the operation and post-operative period were perfectly simple in a patient who was a hemiparalytic.

CASE XVII.—Married woman, æt. fifty years, entered hospital May 4, discharged July 14.

The patient fainted in the street. She complained of severe vertigo, disturbance of speech and weakness in the lower limbs. Eighteen years previously she had an apoplexy, from which she had entirely recovered.

Just above the pubis an intra-abdominal tumor was found about the size of a child's head, which compressed the bladder. Normal temperature.

Operation, June 19. Chloroform narcosis. Splenectomy. Convalescence perfect. Discharged July 14.

The following case is a typical one of an ectopic spleen displaced to the right and fixed in this position by adhesions:

CASE XVIII.—Married woman, æt. twenty-four years, entered hospital August 24, discharged September 29.

Patient had had malaria. Three years ago she noticed a tumor in the abdomen, which gradually increased in size and gave rise to pain.

Examination showed a bosselated tumor, which, from its shape, recalled the spleen, occupying the entire right side of the abdomen and the greater part of the left side. Mobility limited in extent. It was not connected with the generative organs. Percussion dullness over the area of the spleen was absent. Temperature normal.

Operation, August 27. Choloroform narcosis. Incision 15 centimetres long in median line. Spleen easily brought out of incision. Ligature of the vessels separately and en masse. The spleen adhered solidly to the right half of the omentum. Three pedicles were formed in the omentum and were each tied off en masse and divided. Weight of spleen 1466 grammes. The organ contained much connective-tissue.

Convalescence uninterrupted. Patient discharged September 29.

CASE XIX.—Married woman, æt. twenty-seven years, entered hospital January 13, discharged March 12.

Patient had suffered from malaria for the past four years. The spleen was greatly enlarged and very movable, extending eight centimetres below the costal border. It could be displaced to almost any part of the abdomen. Moderate ascites. Patient cannot work. Temperature normal.

Operation, January 22. Splenectomy.

Patient discharged well on March 12.

I will now refer briefly to *intra-abdominal rupture of the malarial spleen.* A severe trauma would be required to cause rupture of a normal spleen, which is small, deep-seated and hidden under the costal border. But in malarial countries ruptures of the organ are fairly frequent. Fevrier, who for years practiced in the south of Tunesia, found that rupture of the spleen was found in 5 per cent. of all medico-legal autopsies.

The enlarged, friable organ is seated immediately under the abdominal parietes, and is, therefore, exposed to external trauma. The adhesions with the diaphragm and stomach contribute to rupture, inasmuch as they pull upon the organ and also fix it.

Spontaneous rupture usually occurs during acute paroxysms of malaria, when the hypertrophied spleen rapidly increases in size. Its parenchyma becomes turgid and the thinned capsule is put upon the stretch. On the contrary, the organ sometimes ruptures at places where the capsule is thickened, and this is due to the loss of its normal elasticity. In order that rupture shall take place, some sudden movement, such as vomiting or coughing, must occur. Spontaneous rupture has been known to occur after.the exhibition of large doses of berberine. This drug, an alkaloid of *berberis vulgaris,* strongly contracts the spleen by acting on the involuntary muscular fibres of the parenchyma during the phase of congestion. The drug, which is used in Italy, has been known to cause rupture, followed by fatal hemorrhage, when exhibited in too large doses.

However, spontaneous rupture is infrequent, the traumatic variety being much more common. The pathological changes, the degree of congestion and turgescence, likewise that of sclerosis, play a large share in the production of rupture of the organ.

Sometimes " *dry rupture* " occurs. For example, Moty met with a case in which the spleen was completely ruptured in two halves, yet

no hemorrhage arose. The case was one of a sclerotic malarial spleen with a very reduced vascular supply.

In other instances, hæmostasis may be favored by thick and numerous adhesions, resulting in the formation of a hæmatoma. Or the omentum, by accidentally entering the tear, may cause the formation of clots, and thus act as a natural plug.

But spontaneous hæmostasis is very rare in splenic rupture; the structure of the parenchyma and the morbid changes resulting from malaria are unfavorable conditions for the production of hæmostasis. The clots break down quickly, the hæmatomata burst and late secondary hemorrhages—which are none the less dangerous—arise. Should the rupture only involve the capsule, there is little or no hemorrhage; the wound becomes covered by a plastic exudate and heals. Wounds of the spleen itself heal by the formation of connective-tissue, and repair rapidly takes place on account of the rich blood supply of the organ.

The exact *diagnosis of splenic rupture* is very difficult to make, as the symptoms are the same as those encountered in all traumatic lesions of the abdominal viscera. A trauma of the left hypochondrium, and the fact that the patient has suffered from malaria in the past, should lead the surgeon to suspect rupture of the spleen.

The prognosis is bad, as the hemorrhage is very free, and added to this there is the specific cachexia which aggravates the situation. Vincent's statistics show that there were only six recoveries out of a total of 134 cases.

As to treatment of rupture of the spleen, it can be summed up in one word, namely, splenectomy. Suture of the rupture or plugging can only be countenanced when the tear does not exceed 1 or 2 centimetres in extent.

It occasionally happens that in cases of trauma of the spleen the thickened capsule of the organ will remain intact while the parenchyma is crushed and the organ transformed into an enormous hæmatoma. The blood, by accumulating, gradually distends the capsule, which finally ruptures. This may occur within a few hours or days following the trauma, according to the rapidity with which the blood flows from the crushed and torn vessels.

If the trauma was moderate, a circumscribed hæmatoma will form under the capsule, which will gradually increase in size like a diffuse aneurysm, while at its periphery fibrinous strata form and fresh quan-

tities of blood are from time to time given off from the friable splenic tissue, which increase the size of the hæmatoma. Above the hæmatoma the capsule distends and thickens, and a globular tumor, with a broad base, develops on the surface of the spleen. Examples of this condition are represented by Cases III and XI.

Finally, the blood may issue from a tear in the spleen and flow into a closed space formed by adhesions, and a perisplenic hæmatoma is the consequence.

The final outcome varies. If the hæmatoma is not large, it may become absorbed or persist for many years. Large hæmatomata rupture and death results from hemorrhage. Lastly, hæmatomata become infected easily and transform into purulent foci, giving rise to peritonitis.

As symptoms, there is pain and more or less pronounced signs of internal hemorrhage. Small hæmatomata offer a mild symptomatology, consisting of pain localized to the splenic region, subsiding in a few days.

If the spleen is extensively crushed, or if the hæmatoma continues to increase, splenectomy should be done as in Cases III and XI. In other instances simple incision, drainage and packing will suffice. The two following cases are other examples:

CASE XX.—Married woman, æt. forty-six years, entered hospital May 22, died May 29.

One month previously, the patient received a blow on the left side of the abdomen, since which time she had not felt well. A slightly movable tumor measuring 32 centimetres long could be felt and diagnosed as a hypertrophied spleen. A second fluctuating tumor could be made out on its surface.

Operation, May 25. Incision along the external border of the left rectus muscle. The tumor was situated on the external aspect of the spleen and proved to be a hæmatoma, covered by a dirty gray membrane. The stomach was lying parallel to the spleen as far as its lower pole, from which point the pylorus descended. The upper part of the tumor was fixed near to the liver by a long pedicle.

The tumor was left *in situ* and sutured to the borders of the abdominal incision. During the operation the patient collapsed and artificial respiration was resorted to.

Two days later the hæmatoma was incised and the contents—a bloody fluid—was evacuated.

Two days later (May 29) the patient died in a state of pronounced asthenia.

CASE XXI.—Male, æt. thirty-seven years, entered hospital May 14, discharged July 14.

Patient has felt ill since May 9; complains of pain in left hypochondrium. This region projects. On May 9 the patient received a blow in the left side of the abdomen, from which date he has complained of pain.

By palpation a rounded fluctuating tumor was felt, evidently connected with the spleen, and reaches 8 centimetres below the costal border. By percussion, the tumor dullness continues with that of the spleen. Temperature normal. May 20, patient very pale and complains of extreme pain.

Operation, May 25. Chloroform narcosis. Incision along the costal border, which exposed the spleen. Wound plugged with iodoform gauze.

May 28 the hæmatoma was incised, giving issue to a large quantity of clot. Drainage.

The discharge continued to diminish up to July 10, when the drainage tube was removed.

Patient discharged well on July 14.

In the following case the patient developed a suppurating hæmatoma. It required three months for the cavity to fill in and the patient died of fatty degeneration of the heart.

CASE XXII.—Male, æt. twenty-three years, entered hospital February 26, died July 2.

The patient entered hospital for an enormous tumor in the left hypochondrium. Two months ago he had been struck on the left side of the abdomen.

The entire left side of the abdomen projected, and a fluctuating, rounded tumor the size of an adult head could be felt. Hydatid thrill could not be elicited. Percussion showed that the tumor dullness continued with that of the spleen. Temperature varied from 37.5° C (99° F.) to 39° C. (102.5° F.).

Patient complained of abdominal pain, which kept him from sleeping. A purulent, bloody fluid was withdrawn by puncture.

Operation, June 2. Resection of two ribs. Cavity of tumor contains a quantity of pus. Irrigation and drainage.

June 6. Patient does not sleep. Dyspnœa.

June 7. Temperature 39.4° C. (103° F.). Much pus on dressings. The temperature continued high, with anorexia and pus-soaked dressings until June 13.

June 13. Profuse sweating. Patient feels better. Temperature 38° C. (101° F.); appetite returning; amount of pus less; the wound cavity was filling up.

June 20. Drain removed from thoracic cavity.

June 24. Drain removed from spleen. Temperature normal.

July 1. Temperature 39° C. (101° F.). Complains of much pain in throat and dyspnœa. Œdema of pharynx and soft palate. Dullness over both lungs. Evening temperature 36° C. (97° F.). Profuse sweating. Death from asphyxia.

Autopsy. A large amount of serous fluid in both pleural cavities and pericardium. Heart very large, fatty degeneration of myocardium. Small amount of exudate in abdominal cavity. Spleen enlarged and friable. The operative wound corresponds to an abscess in the upper pole of the spleen.

Sero-sanguineous cysts of the malarial spleen are rare and are, for the most part, the consequence of a trauma. Their pathogenesis is still obscure. Randohr is of the opinion that the splenic capsule, being softened, tears easily from a slight trauma, and a portion of the parenchyma protrudes through the rent, forming a hernia. The peritoneal epithelium adheres to the latter, penetrating it deeply, then proliferates in the parenchyma and secretes a serous fluid. The tumor becomes covered by a connective-tissue capsule.

A considerable quantity of blood becomes mixed with the serous fluid, coming from the softened splenic pulp and the cyst gradually enlarges. Large cysts may contain as much as nine or ten liters of dark brown fluid with an alkaline reaction and a specific gravity of 1018 to 1027. It is composed of blood serum mixed with blood, contains many red blood corpuscles, some white cells, shreds of fibrin, cholesterin, lecithin, blood pigment, fatty bodies, fatty acids and inorganic salts of sodium and calcium. Usually the fluid is sterile, but these cysts may become infected and suppurate.

The capsule varies in thickness and calcium deposits are often found in it. The inner surface of the capsule is lined by epithelium, either totally or in areas.

The cysts vary in shape being either round or oval; they may be pedunculated and in size vary from that of a fist to an adult head.

The cyst may not make itself clinically evident for some time after the receipt of the trauma. In Wertel's case, the patient was struck in the abdomen five years before. They develop slowly at the outset and remain latent, then suddenly they rapidly increase, and this is especially true when suppuration arises.

Small cysts may be unnoticed for years, but as the tumor enlarges it presses on the surrounding structures, contracts adhesions with them, giving rise to pain and functional changes.

The diagnosis is frequently very difficult on account of the considerable deformity of the spleen caused by the cyst.

In circumscribed cysts of small size enucleation may be attempted, but when large excision must be done, hemorrhage is apt to be free. Splenectomy is to be rejected with few exceptions on account of the extensive adhesions, which render this procedure impossible.

Here are the notes of two cases of cyst operated at the Ekaterinodar Hospital.

CASE XXIII.—Married woman, æt. forty-five years, entered the hospital October 2, discharged January 22.

The patient was a malarial subject. Four years ago she noticed a tumor in the left hypochondrium, which gradually increased in size. By palpation, a bosselated tumor could be felt, which extended below the left costal border and reached the median line to the umbilicus. Fluctuation could be detected in its centre. Temperature normal.

Operation, October 4. Median incision from xiphoid appendix to the umbilicus. The tumor, whose walls were thin, was very large and fluctuating. It was adherent to the omentum and intestine, and this prevented delivering its lower pole.

The abdominal incision was partially closed. The upper part of the incision was packed with iodoform gauze over the tumor. Dressings changed every second day.

October 8. The purulent blood contents of the cyst were evacuated by incising the cyst.

October 21. Secretion putrid. Irrigations of cyst cavity. Temperature normal.

October 26. Paroxysm of malaria. Quinine.

Patient discharged well on January 22.

CASE XXIV.—Married woman, æt. fifty-two years. Entered the hospital October 16, died October 22.

Patient had had malaria for fifteen years. By palpation a tumor

could be felt in the left hypochondrium and a marked ascites was detected. Exploratory puncture was made withdrawing nearly ten liters of sero-bloody fluid. This puncture greatly relieved the patient.

After this, a large tumor could be distinctly felt in the left hypochondrium, its shape recalling that of the spleen. The tumor was bound to the uterus, which, from this fact, was drawn up out of the true pelvis.

A second puncture was made twelve days later, at which time six liters of fluid were withdrawn. The patient insisted upon a radical operation.

Operation, October 21. Chloroform narcosis. Median incision; the cyst was accidentally opened, giving exit to much purulent fluid. The cyst walls were very thick (4 centimetres) on the left side, very thin on the right. The cyst was adherent to the anterior abdominal wall and to the intestine. A large adhesion bound it to the left uterine cornu. Death on the following day.

Having had no experience with tropical abscess occurring in a malarial spleen, I shall not refer to this question. I would say that my twenty-fifth case was a simple splenectomy on a young woman for malarial splenomegalia, and, therefore, need not be more fully reported. The patient made an excellent recovery.

In closing, I would offer the following conclusions: (1) In the acute form, malaria is accompanied by temporary hyperæmia of the spleen; (2) chronic malaria produces permanent hypertrophy of the spleen, causes profound morbid changes of the parenchyma, attacks the splenic ligaments, and thus provokes displacement of the organ; (3) this splenomegalia, interfering with the functions of various viscera, usually in time brings about cachexia; (4) the ectopia frequently results in torsion of the splenic pedicle; (5) the histological changes of the splenic tissue predisposes the spleen to rupture, the development of cysts and suppuration and aggravates the prognosis of abdominal traumatism in these patients; (6) the only treatment of malarial splenomegalia is splenectomy. The removal of the spleen will not cure the malaria, but will rid the patient of all the possible accidents arising from the hypertrophied spleen; (7) splenectomy does not cause untoward functional changes, no matter at what age the operation is done; (8) splenectomy for malarial splenomegalia is not always possible to carry out, and even at the best the mortality is high.

TWO SPLENECTOMIES—THEIR LESSONS

By J. M. GASTON, A.M., M.D.
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A CHINESE boy, Li Kai Yin, aged fourteen, entered Mayfield Tyzzer Hospital, Laichow, China, February 26, 1918.

Condition on Admittance.—Spleen enlarged to umbilicus and freely movable, and can be palpated from left epigastric area beyond the median line backwards to kidney. Notches characteristic of the spleen are perceptible. The liver is much enlarged. There is no pain, but great anæmia, watery stools, weakness and inability to go about. Temperature, pulse and respiration show fever and systemic infection, and there are epistaxis and diarrhœa.

Diet.—Patient is unwilling to eat eggs, but eats millet, vermicelli, bread or vegetables.

Preliminary Treatment.—Fowler's solution (Liquor potassi arseniatis). After calomel and santonin passed arcaridos lumbricoides.

After the observation of his condition for two weeks it was our determination to operate for the splenomegaly by aplenectomy, but owing to his weak condition, we found it necessary to continue treatment. Mercurial inunctions over hypochondrium and splenic regions did not perceptibly soften the spleen, but reduced the size of liver and caused slight ptyalism.

Diagnosis.—In the meantime efforts were made to arrive at the cause of the splenomegaly. The case presented no symptoms of Kala-azar, but many of Banti's disease.

We supposed the case to be one of leukæmia and were encouraged with the statistics to believe that even for this condition the splenectomy would be advisable. Consulting Dr. A. W. Yocum, of Pingtu, he kindly reported on the literature of cases of pernicious anæmia, and considered that the outlook was good for such cases.

March 21st: Nearly one month having elapsed from his admittance, on examination the boy presented the following symptoms:

Area of liver less indurated. Spleen movable, and seems detached from diaphragm. Both the poles of the spleen and the notches were

felt. The extent of the excursion of the spleen are limited to umbilicus on the interior surface and the kidney on the posterior surface. Complication: Parotitis, but seems relieved of most urgent symptoms. Anorexia persists. Night sweats that were quite severe for some nights have become less so.

Medicinal treatment has consisted of a formula containing carbonate of ammonia, oil of turpentine and camphor water in an emulsion of gum acacia. He had been taking a diarrhœa mixture subnitrate of bismuth, and prepared chalk with paregoric and aromatic spirits of ammonia.

The abdominal distention was considerably reduced.

March 22: Patient seems to be sleepy and falls asleep while talking, when he lapses into delirium. The opiate is not sufficient to account for this. He has no pain or nausea. Temperature from 103° to 104° F.

Diet.—Has been enjoying some onion soup with vermicelli.

Urinalyses.—Sugar and albumen.

Blood Test.—Drop of blood from ear gives 80 per cent. hæmoglobin.

Treatment.—Syrup of iodide of iron and general tonics of hypophosphites of iron, quinine and strychnine.

March 24th: The patient has continued in a semi-comatose condition. The temperature has been erratic, with sweats, such as we find in hepatic abscess. Suspicion of abscess of the spleen led me to palpate spleen and at one point I thought I detected fluctuation. Later in same examination, failed to find evidence of pus.

(The operation was done before this focus of infection had spread to the remaining parts of the spleen. Hence the results of the physical examination.)

Treatment.—His pulse has been quite rapid and digitalis was added to turpentine emulsion.

He has taken quinine first in the form of bisulphate tablets of three grains, then of five grains. The latter caused a deafness and were discontinued after two were taken.

He is having subnormal temperature. His temperature during the night reached 94° F., but with hot bottles the temperature rose to 96° F. (This temperature is the lowest in my experience for a patient

from which to surprisingly recuperate.) Operation was clearly contra-indicated unless a change occurred.

About this time he improved and I wrote to Doctor Yocum and urged him to come and operate with me, as I could not see my way clear to undertake such a formidable operation with no other physician than myself. He answered on the 31st, promising to come. In his letter he remarked:

"The Mayo Clinic have operated during a course of fever on several cases, also on cases with cardiac and renal symptoms, but I have not read of any case with such a subnormal temperature as your case has manifested. Several operators recommended preliminary trans-fusion in severe cases."

In this letter Doctor Yocum asks:

"Have you been able to eliminate syphilis as a probable factor in your case? Such cases often do not respond to anti-syphilitic treatment until after splenectomy."

To this I replied that it was difficult to rule out syphilis in China; but there was no history to lead me to suspect a hereditary syphilis and he had not been exposed to the disease. He was quite young and undeveloped, not having reached puberty.

I did not have a Wassermann done, but examined for spirochæte pallida in the pus found in the spleen when removed. No spirochæte were found.

In view of all the circumstances we decided to operate, and while we could not give any hope for recovery without operation, we knew there was no small risk from shock.

April 4th: Chloroform was administered by the drop method. We had the advantage of the new autoclave we have installed in the hospital, and were careful to obtain asepsis.

Both Doctor Yocum and myself wore rubber gloves, after having washed our hands in liquid soap, and passed them through solution of permanganate of potash and oxalic acid followed with normal salt solution. Bichloride solution was used for gloves and tincture of iodine for the external skin, which had been carefully prepared the day before.

No preliminary injection of any kind was given, owing to his age and other contra-indications.

The right rectus incision from costal margin to the iliac crest

was made down to peritoneum. The latter was thin and was slit with scissors guided by a grooved directory. Some fluid was found in the peritoneal cavity. The gloved hand was passed into the cavity and no adhesions of consequence noted.

The lower pole of the spleen was delivered first, then gradual traction brought out upper pole. Veins and arteries of hilum came into view.

While Doctor Yocum held the spleen, and standing on the left side of patient, observed the hilum; ligation of the vessels was done from the median line outwards, by operator on the right side. About six silk ligatures were passed, forming a chain of sutures. When the splenophrenic ligament was located and ligated by double ligatures and a clamp used, the stump was severed by scissors. Then some blood gushed from spleen. A portion of spleen was broken down and the soft tissue resembled an abscess. When portions of this were examined by microscope later, pus cells were discovered.

Blood-cells stained by the Leishman method show some cells, others distorted. Poiktosis was marked but Leishman-Donovan bodies not found.

A suggestion of Doctor Yocum was adopted and the stump invaginated in a fold of peritoneum. Then the main peritoneum was closed with chromic catgut sutures. The outer layer of sutures consisted of silkworm gut.

Immediately after the operation profound shock but no hemorrhage was noted. A resort to the subnormal solution of saline by infusion in the chest resulted in improvement. A preparation from suprarenal glands was followed by even greater stimulation.

As a preliminary feature of the operation, a sandbag was put in the stove and heated to keep up body temperature. This was used under patient's loins. As the operation lasted nearly two hours, we did not anticipate the burn which we noticed later from the sandbag.

Although this was a complication in the recovery which followed, the patient improved from the day of the operation. On the eighth day the stitches were removed, and union by first intention had taken place.

He ran a much better course than before the operation. The temperature curve was almost normal. The pulse became regular and the respiration normal.

His appetite was good. His digestion improved. He has been able to eat eggs, vegetables, graham bread or porridge. Chicken soup, beef soup and small quantities of chicken have agreed with him.

Between April 13th and May 17th daily dressings of burn, and as the boy presented no other impediment to dismissal, he was allowed to go to his home about twenty miles north of this place, on May 17th, riding a donkey.

His bowels were regular and formed. No more nose bleed occurred, but at times there appeared symptoms of previous infection, as when temperature rose to 103°.

Otherwise, the boy continued while in the hospital to develop, and recovery was uninterrupted. After going home, I saw him no more, but in passing through his home town, I sent word that I wished to see him. He was not at home, and his mother reported he had recovered and was on his way to Peking to make his fortune. He had fattened and all traces of his previous anæmia seemed to leave him.

The time that had elapsed was eight months from the operation, and over nine months from the time he was admitted. At this writing, January 29, 1919, there is no reason to doubt that he will live for years. The weight of spleen was three pounds.

The use of the sandbag was of considerable help and was a suggestion made in an article by Dr. W. P. Carr, of Washington, D. C. He has written of his technic, which is quite important. As in gall-bladder or kidney operations, the pressure of a sandbag or other hard pad serves to enable the operation to reach the spleen. Another hint given by Doctor Carr is to let air enter around the hand in delivering the upper pole of the spleen. In some cases, even when no great adhesion exists, the atmospheric pressure is sufficient to hold the spleen against the diaphragm.

As this case was in the hospital over a month before an operation could be done, and yet when operation was done, survived, we were encouraged to advise another patient who had but recently come into the hospital to undergo operation.

His condition was a more chronic one, and his age was greater, but the diagnosis of spleen and liver enlargement were the same. He had cardiac and renal complications as in some of the cases mentioned in the Mayo Clinics.

Having found the operation itself somewhat less beset with difficulties than I had expected, I asked Doctor Yocum, who had come

some distance, to remain over for another splenectomy. This was done on April 5th, the day following the first.

The man was twenty-five years old, had the whole abdomen practically filled with the enlarged liver and spleen. He was given a preliminary hypodermic of morphine sulphate gr. $\frac{1}{4}$ and atropine sulphate gr. 1/150. He had been prepared for the operation and was in fairly good spirits. He was anæsthetized with chloroform.

The incision was made in the line of the left border of the left rectus muscle from the costal border, below the crest of the ilium. The spleen presented readily. His case though was complicated by serious adhesions. The upper pole was adherent to the diaphragm. The effort to free the adhesions caused a rent in the spleen. He was losing some blood from this rent, and it became necessary to deliver the spleen before we would have otherwise done so.

It is in these cases that some authors have advised surgeons to desist and leave the spleen *in situ*. But it was not possible to leave the patient with a ruptured spleen. Under all the circumstances we were able to close up the wound and bury the stump very much as in the previous case. He was given the infusion of saline solution, but did not respond as in the younger patient. He lived only about two hours after the operation. The shock was too great, and the heart too weak, and he did not rally. But as an instance of removing a very large spleen, he offers a number of interesting points for study, and for comparison:

Size and Weight.—The size was unusual. The length from pole to pole longitudinally was $14\frac{1}{2}$ inches, and diameter extending from region of left kidney to the liver about the same upper pole measured about 8 inches, and the lower about 7 inches in length. The whole at its greatest circumference was 28 inches. The weight was 5 pounds.

Dr. J. G. Earnest, of Atlanta, Ga., U. S. A., described before the Georgia Medical Association, Savannah, in 1902, a case in which he removed a spleen that extended well into the pelvis in a woman. He says:

" The mass was found to be the displaced spleen about 22 centimetres in length, crowded down into the pelvis with the convex surface at the bottom and the two ends brought up in such a manner as to give it a crescentic shape." In his case nine inches would represent the length as compared with $14\frac{1}{2}$ inches in this man's.

In a case reported by Dr. J. Wesley Bovée, of Washington, D. C.,

and found on page 235 of the Transactions of the Medical Association of Georgia, the following measurements are given: $11\frac{1}{4}$ inches at the smaller end, and a corresponding thickness of $2\frac{3}{4}$ and $1\frac{3}{4}$ at the ends, respectively. He mentions the weight as four pounds and four ounces. This large spleen was removed successfully. But a year previously Doctor Bovée had reported (*Medical News,* 1899, vol. lxxv, p. 848) two cases of splenectomy, one of which was successful and one unsuccessful as in my record above. One of his operations was done for a leucocythæmic spleen weighing twelve pounds and seven ounces, and as a complication the patient, a woman, had clubbing of the cardiac valves. Death occurred from shock just as the tumor was being pulled from the abdominal cavity. He adds significantly:

" Death occurred . . . it seemed the support to the diaphragm and heart by pressure from the large spleen had been gradually increased by the growth of the tumor and now was necessary to prolong life, and as soon as it was removed by taking away the tumor collapse immediately occurred. I now believe removal of the enlarged organ under such conditions, even though the heart be normal, is absolutely unjustifiable."

In reading Doctor Bovée's remarks on his operations, we have noted one suggestion which was found to work well in both cases operated upon, *viz.,* the use of saline solution in the peritoneal cavity immediately after the delivery of the spleen. The shock will be greater while the spleen is being handled for the ligation of the hilum.

The saline solution serves a double purpose of replacing any fluid in the blood-vessels, and of replacing the pressure upon the diaphragm. It is possible to hold up the spleen so as to reach the large blood-vessels without too great tension upon them.

Unless the spleen is delivered the vessels are practically out of reach. Yet I could conceive of a necessity for ligating the vessels without removing the spleen, as it might be wiser to do when adhesions prevent. In such a case, and without rupturing spleen, would it be possible to reach the vessels better for ligation if a retro-peritoneal incision were made, as in kidney operations? I should attempt to do this by a new incision in the lumbar region, and by combined manual traction secure the vessels, when it might even possibly clear the way for a detaching of the adhesions in a manner which would be safe.

The records of difficult cases should not deter surgeons from giving

patients the benefit of the doubt in their own minds, but they should not be undertaken without assistance.

I have been led to operate on these two cases in China, after having refused to operate in what seemed to be extremely doubtful cases both in America and in Asia. I wish to acknowledge with gratitude the work done in this line by many of our medical missionaries in China, such as Maxwell, Roys, Whyte, Polk, Hutcheson and others.

I can give but a brief list of books and papers consulted since this subject has been considered. I think the papers that have appeared in the *China Medical Journal* have been of the best I have read. They are guideposts for future travellers on this road.

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LARGE INTRALIGAMENTOUS CYST COMPLICATING PREGNANCY; OPERATION; RECOVERY *

By B. F. ZIMMERMAN, M.D.

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WHILE tumors and cysts of various types coëxisting with normal utero-gestation and complicating delivery are quite common, according to my observation and experience the case herein reported is in several respects unusual. Careful search of the literature for the last few years fails to disclose a parallel example.

Intraligamentous cysts may develop within the broad ligament at any period, but like other cystomata involving the pelvic viscera are most frequently noted during the active sexual life of the individual, *i.e.*, the child-bearing period. As a rule they are small in size and cause distressing clinical symptoms from pressure upon adjacent organs. Large cysts of this type are rare.

According to Senn ("Pathology of Tumors") the parovarium is frequently the site of cyst formation; this structure is an embryonic remnant and consequently frequently contains the essential tumor-matrix. Cysts of the parovarium are also called "cysts of Rosemuller's organ," because their origin in the broad ligament in which they are situated corresponds to the site of these embryonic remains. Verneuil, Doran, and De Sinety believe that these cysts are developed in the connective tissue independently of the parovarium. Supernumerary ovaries must also be remembered as a possible source of such cysts.

Intraligamentous cysts of the broad ligament often attain the size of a fœtal head, contain a clear fluid, and are lined by squamous, ciliated, or columnar epithelial cells, according to the origin of the tumor-matrix. In diagnosis they are often mistaken for ovarian cysts and for the different varieties of retention-cysts of the Fallopian tube. Their removal by enucleation is one of the most difficult of all pelvic operations. Tapping these cysts is not attended by much

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risk, and the operation has occasionally resulted in a permanent cure (Senn).

MacCallum (" Pathology ") disposes of the subject in three lines, as follows: " Cysts of the parovarium are generally unilocular, thin-walled, and filled with clear fluid. They are derived from the par-ovarian remnants which lie in the mesosalpinx and the cyst is found in that situation."

CASE REPORT.—Mrs. N., aged thirty-two years, mother of two children, one a year and seven months old, the other born about the first of September, 1919. There is nothing of interest in the family or previous personal history. Following the birth of her first child she noticed that her abdomen remained quite large, but little attention was given the matter and the swelling finally partially disappeared according to her statement. There was no history of pelvic disease, nor had she ever complained of pelvic pain.

During her last pregnancy she had an attack of influenza, and the physician who saw her at that time detected fluid within the abdominal cavity which he thought was probably due to the influenzal infection. There was no evidence of an intra-abdominal tumor, and the attendant concluded the fluid was the result of obstruction to the portal circulation, or an inflammatory lesion, due to influenza, as the patient had pronounced abdominal symptoms during the attack. How-ever, pregnancy progressed normally and the woman was delivered at term without unusual incident. The child weighed eight pounds and is still living.

The patient was referred to me by Dr. H. G. Hartman, of Louis-ville, Kentucky, ten days after delivery of her second child, i.e., September 10, 1919, at which time her abdomen was tremendously en-larged, and the presence of fluid was unmistakable. The tentative diagnosis of ovarian cystoma was made and operation advised, but as only ten days had then elapsed since the birth of her child, we decided to aspirate rather than subject her to operation at that time. Para-centesis was practiced and three and one-half gallons of clear fluid withdrawn ten days after delivery.

Reaccumulation was rapid, and exactly two months later, when celiotomy was performed, the cyst contained three gallons of fluid. Operation demonstrated that the cyst was intraligamentous, the ovary being uninvolved. I believe an intraligamentous cyst of this magnitude

is uncommon.   I presume it originated in the parovarium or in some remnant of the Wolffian structure.   The operation was completed without untoward incident, and the patient left the hospital well within three weeks.

It may be interesting to reiterate that as a rule intraligamentous cysts are small in size, they usually produce distressing pressure symptoms, they are of slow development and when evacuated refill rather slowly.   On the other hand, this cyst was unusually large, it produced no symptoms, and it refilled rapidly after aspiration.

The feature of greatest interest is that with a cyst of this magnitude the patient went to full term and was delivered normally of a living child weighing eight pounds.

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Progress of Medicine
For the Year 1919

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SYPHILIS

Wassermann Reaction.—The Wassermann reaction carried out according to the method of McIntosh and Fildes, with cholesterolized antigen, Lewis and Newcomer (*Jour. Exper. Med.,* April 1, 1919, 29, No. 4, p. 351) find, leads to about the same result as when it is done according to the method recently proposed by Noguchi. They further review the practical application of the Wassermann test, calling attention to certain conditions which may give a positive reaction in the absence of syphilis. The superiority of the ice-box, or cold fixation, over the warm fixation is pointed out by Thomas (*N. Y. Med. Jour.,* June 21, 1919, 109, No. 24, p. 1069) and Berghausen (*Jour. Amer. Med. Assoc.,* April 5, 1919, 72, No. 14, p. 996).

The presence or absence of the Wassermann reaction, as a guide in the treatment of this disease, is not considered nearly so significant as formerly. The reaction should not be depended on as a guide for treatment during the first year of infection, according to Thibierge (*Presse Méd.,* November 28, 1918, 26, No. 66, p. 609), and Tauber (*Jour. Amer. Med. Assoc.,* November 29, 1919, 73, No. 22, p. 1661) believes that negative Wassermanns during treatment only indicate progress. A method has been devised by Simon (*Jour. Amer. Med. Assoc.,* May 24, 1919, 72, No. 21, p. 1535) which he believes to be of considerable value in clearing up the so-called doubtful or partial reactions—that group which is so confusing to the clinician.

Treatment.—The intensive treatment of syphilis with arsenical preparations and mercury if followed up properly will result in not only arrest of symptoms but cure, as cases of reinfection have been reported by Schamberg (*Jour. Amer. Med. Assoc.,* September 13, 1919, 73, No. 11, p. 826), which may be taken as evidence of cure, as the disease does not confer immunity, the apparent immune being an

active syphilitic (Dinnick, *Lancet,* June 21, 1919, 1, No. 25, p. 1055).

Early intensive treatment may ward off or abort an attack of syphilis, according to Lacapere and Laurent (*Bull. Med.,* September 27, 1919, 33, No. 41, p. 539) and Pinard (*Presse Méd.,* May 8, 1919, 27, No. 26, p. 249), the experiment of Magian (*Bull. de l'Acad. de Med.,* May 20, 1919, 81, No. 20, p. 657) upon himself appearing to confirm this view.

The Director of the Hygienic Laboratory, U. S. P. H. S., Dr. G. W. McCoy (letter to *Jour. Amer. Med. Assoc.,* May 10, 1919, 72, No. 19, p. 1386) urges employment of high dilution (0.1 gm. to 30 c.c. of fluid) and slow administration (two minutes for each 0.1 gm.) in the intravenous injection of arsphenamin. He further states that " any physician who fails to observe these precautions should be considered as directly responsible for serious results that follow the improper use of the drug."

This statement of McCoy's is believed by several observers as unwarranted, in view of the fact that some physicians prefer administering this drug in higher concentration, more rapidly. The concentrated syringe method is preferred by Lockhart and Atkinson (*Brit. Med. Jour.,* January 11, 1919, 1, No. 3028), but Milian (*Paris Méd.,* April 5, 1919, 9, No. 14, p. 261) lays the greatest stress upon the imperative necessity of making the injection very slowly.

From the clinical results obtained in a large number of cases, Leonard (*Brit. Med. Jour.,* August 30, 1919, 2, No. 3061, p. 266) favors the intramuscular method of administering arsphenamin, and Araujo (*Brazil-Medico,* July 27 and August 3, 1918, 32, No. 30–31, pp. 234–241) states that the intrarectal route is to be preferred for the administration of arsphenamin in children, although he believes that mercury is the ideal remedy for syphilis in the very young.

The intravenous injection of arsphenamin is not entirely free from danger, in spite of the fact that some writers consider it a very safe drug. The appearance of jaundice, with or without pigmentation, or exfoliative dermatitis occasionally occurs (Lynch and Hoge, *Jour. Amer. Med. Assoc.,* November 29, 1919, 73, No. 22, p. 1687; Nagai, *Bull. Naval Med. Assoc. of Japan,* June, 1919, No. 24, p. 3; Latham, *Jour. Amer. Med. Assoc.,* July 5, 1919, 73, No. 1, p. 14). Fatalities and serious complications are also reported by Bory (*Bull. de la Soc. Med. des Hop.,* January 31, 1919, 43, No. 4, p. 84), and Petges

(*Jour. de Med. de Bordeaux,* October, 1918, 89, No. 10, p. 293). The acute "nitritoid" crisis, or reaction to arsphenamin, which may or may not be a form of anaphylactic shock, Milian (*Paris Méd.,* April 5, 1919, No. 14, p. 261) believes may be forestalled by careful temperature observations every three hours after the injections, depending upon adrenalin in the treatment of this condition, as does Pardo (*Rev. de Med. y Cir.,* August 10, 1919, 24, No. 15, p. 395). This crisis can be inhibited, according to Stokes (*Jour. Amer. Med. Assoc.,* January 25, 1919, 72, No. 4, p. 241) by a previous injection of 1/50 grain of atropin. The various reactions which may follow this method of medication have been carefully observed in a large number of cases by Guy (*Jour. Amer. Med. Assoc.,* September 20, 1919, 73, No. 12, p. 901).

INFLUENZA

Nearly the entire world has been visited during the past year and a half by an epidemic which has exceeded in extent, rapidity of distribution and mortality any epidemic of modern times. The term "influenza" has been applied to the disease for want of a better name, the exact nature of the etiological factor being still undetermined. In view of our uncertainty as to the etiology of the disease, it is extremely difficult to decide upon the factor or group of factors responsible for the outbreak—whether the grouping together of large masses of men was responsible, or whether certain weather conditions may have had a bearing on the epidemic, as Magelssen (*Norsk Mag. f. Laeger.,* July, 1919, 80, No. 7, p. 749) has suggested.

That there are very good reasons for believing that influenza in itself is not a serious condition is the opinion of Flexner (*Jour. Amer. Med. Assoc.,* September 27, 1919, 73, No. 13, p. 949), its sinister character being due to the remarkable frequency with which it is followed, under particular circumstances, by a concomitant or secondary pneumonic infection, to which the severe effect and high mortality is traceable. He believes that it is this invasion of the respiratory organs with bacteria commonly present in the upper respiratory tract—streptococci, pneumococci, staphylococci, Pfeiffer's bacilli and even meningococci—that stamps the recurrent waves of the epidemic with its bad name. From an extensive study of the cases in their locality, the Camp Lewis Pneumonia Unit (*Jour. Amer. Med. Assoc.,* January 25, 1919, 72, No. 4, p. 268) state that the cases were mild or

severe depending on the resistance of the individual or variations in the virulence of the organism, rather than the accepted idea that pneumonia complicated one case and not another, as they believe it amply demonstrated that the process, whether mild or severe, is etiologically and pathologically the same, with all gradations from a slight involvement of the bronchioles and adjacent alveoli to extensive involvement of an entire lobe.

Special interest is attached to this pandemic, owing to the fact that large bodies of men were grouped together in the various fighting forces, permitting of a more thorough study of the epidemiology of the disease than could otherwise have been made. In the American Expeditionary Forces the epidemic was characterized (Longcope, *Jour. Amer. Med. Assoc.*, July 19, 1919, 73, No. 3, p. 189; MacNeal, *Arch. Int. Med.*, June, 1919, 23, 657) by three definite outbreaks or peaks, the first, occurring in April and May, 1918, was comparatively mild and was spoken of as " three-day fever." The second, in September and October, 1918, formed a part of the terrible pandemic. The third definite outbreak was much less severe and occurred in January and February, 1919. Some conception of the high morbidity and terrible mortality attending the epidemic generally may be obtained by a study of the figures in the army camps in this country as reported by Soper (*Jour. Amer. Med. Assoc.*, December 7, 1918, 71, No. 23, p. 1899). Space does not permit quoting his figures in detail, but a general idea of the havoc created by the epidemic may be obtained from his statement that among the troops in this country about one in every five had influenza, that of these about one in six developed pneumonia, and that of the pneumonia patients about two out of every five died. This means that out of a million and a half troops there were over three hundred thousand cases of influenza reported, about forty-eight thousand cases of pneumonia and nearly twenty thousand deaths.

Prevention.—The administrative control of the disease is a subject of the greatest interest and importance in view of the possibility of a recurrence of the outbreak or future epidemics. The literature upon this subject is too exhaustive to consider in detail, but the problem is handled from two different viewpoints—the army or navy camp and the civilian population.

The absolute control possessed by the military authorities renders

their problem immeasurably less difficult than that of the health authorities in the large cities. The fact that in the majority of the cantonments large numbers of men lived under one roof, in close contact, tended to equalize conditions.

There is considerable difference of opinion in regard to the advisability of closing the schools, theatres, etc., the majority of writers believing that the adoption of these measures had no effect upon the course of the epidemic. In view of what we believe to be the method of transmission of the disease, the prevention of large numbers congregating together would seem one of the most logical prophylactic measures (*Jour. Amer. Med. Assoc.,* December 21, 1918, 71, No. 25, p. 2068).

The gauze mask as a means of preventing the spread of the disease, especially for those coming in close contact with the sick, has attained considerable vogue. Favorable results following the employment of masks are reported by Rénon and Mignot (*Paris Méd.,* November 16, 1918, 8, No. 46, p. 387) and by Vincent (*Bull de l'Acad. de Med.,* October 15, 1918, 80, No. 41, p. 348). They appeared to be of no avail in the experience of Loomis and Walsh (*New York Med. Jour.,* January 25, 1919, 109, No. 4, p. 135), and Hill (*Brit. Med. Jour.,* March 1, 1919, 2, No. 3035, p. 238) believes that they act against the natural defensive mechanism. Experiments to determine the degree of protection provided by various filter materials have been described by Weaver (*Jour. Infect. Dis.,* March, 1919, 24, No. 1, p. 218) and Tolman, Guernsey, Charleston and Dougherty (*Jour. Infect. Dis.,* June, 1919, 24, No. 6, p. 637), the former employing gauze of various degrees of mesh, and the latter employing felt.

The importance of the eye as a portal of entry in acute respiratory infections has been demonstrated by Maxcy (*Jour. Amer. Med. Assoc.,* March 1, 1919, 72, No. 9, p. 636) in a series of experiments.

Etiology.—The etiological factor in the recent pandemic of so-called influenza remains so far undetermined, in spite of the innumerable studies made with the object of determining the cause of this disease, although these investigations have contributed to our knowledge of the various organisms which are present in the disease and which are probably of considerable importance, in being responsible for the secondary manifestations and complications of the original process.

Considerable interest attaches to the possibility of a filtrable virus being the agent causing the original infection which paves the way for the secondary infections. This view is supported by the investigations of Nicolle and LeBailly (*Compt. rend. Acad. de Sc.,* 1918, 167, 607), who found that the bronchial secretions in the acute period of the infection contained a virulent, filtrable virus, to which monkeys and men were susceptible. By inoculations carried out upon himself, Dugarric de la Rivière (*Compt. rend. Acad. de Sc.,* 1918, 167, 606) believes he has demonstrated the presence of this virus also in the blood. The experiments of Nicolle and LeBailly (*v.s.*) upon monkeys were repeated by Gibson and Connor (*Brit. Med. Jour.,* December 14, 1918, 2, No. 3024, p. 645) with identical results, confirming the previous experiments. In this connection the work of Yamanouchi, Sakakami and Iwashima (*Lancet,* June 7, 1919, 2, No. 4997, p. 971) is of interest. They obtained a filtrate from the emulsified sputum from forty-three patients, which they injected into the nose and throat of twelve human beings, six of whom had recovered from influenza. The six who had not had influenza developed the disease, the six convalescents remaining unaffected. A filtrate obtained from the blood of influenza patients was injected into the nose and throat of six persons; four were given it hypodermically and four were given sputum filtrate hypodermically. All of these inoculated individuals developed the disease within two or three days, except one who had previously had influenza.

A filtrable organism in the form of a minute, coccus-like body has been cultured by Gibson, Bowman and Connor (*Brit. Med. Jour.,* March 22, 1919, 2, No. 3038, p. 331) employing Noguchi's cultural methods, from the kidneys of infected animals, the filtrates of lung tissue and the filtered sputum from cases of influenza. Animal experiments with this organism have resulted in the production of lesions closely resembling those seen in the lungs of men.

The isolation of minute, coccus-like bodies has been reported by Bradford, Bashford and Wilson (*Brit. Med. Jour.,* February 1, 1919, 1, No. 3031, p. 127), the organisms being gram-positive, anærobic, able to resist heating to 56° C. for thirty minutes and to pass through Berkefeld N and V filters and Massen porcelain filters. The organisms were recovered by culture from the blood of six out of nine cases of influenza examined, from the sputum of six cases, and from

the cerebrospinal fluid in the only case examined. The same authors (*Quart. Jour. Med.,* April, 1919, 12, No. 47, p. 259) have carried out animal experiments with the organism isolated, the results of which they claim fulfil all the requirements necessary to establish this organism as the cause of influenza. Their work has been carefully investigated by Arkwright (*Brit. Med. Jour.,* August 23, 1919, 2, No. 3060, p. 233), who is forced to the conclusion that their findings were due to contaminations and errors in technic. To this article are appended notes by Bradford and Wilson (pp. 236 and 237), in which they withdraw their claim that their work has proved that the filter-passing organisms of the diseases in question (influenza and trench fever) have been grown in pure culture.

The rôle played by the *influenza bacillus* in the recent epidemic has been the object of an enormous amount of study and investigation, but the conclusions reached by the various writers have been far from unanimous. A careful analysis of sixty-six articles reveals the fact that in twelve (18.1 per cent.) of them the writers believe that the influenza bacillus is the cause of the disease, in ten (15.2 per cent.) that it is an important factor, in fifteen (22.7 per cent.) it is one of the causes but not the most important, while in twenty-nine (44 per cent.) the writers either definitely state that it is not the cause or support the claims of some other organism as the etiological factor. The studies upon which these divergent views are based are too numerous to be recorded in detail, but they seem to be equally extensive and reliable, making it difficult to reconcile the conflicting views. That the predominating organism varied in different localities is very well illustrated by the studies of MacCallum (*Jour. Amer. Med. Assoc.,* March 8, 1919, 72, No. 10, p. 720) who found at Camp Lee the pneumococcus was the predominant organism, the influenza bacillus being found in only a few cases; at the Johns Hospkins Hospital no influenza bacilli whatever were present; while at Camp Dix the organism was found in every case. The locality in which the investigation was made, therefore, must be accepted as one of the determining factors in accounting for the discrepancy between the various writers. The stage of the epidemic in which the studies are made may also have some bearing upon the findings, as has been shown by Goodpasture (*Jour. Amer. Med. Assoc.,* March 8, 1919, 72, No. 10, p. 724), who found the influenza bacillus in 86 per cent. of

twenty-six autopsies, often in pure culture, during the early period of the local outbreak which he investigated, while in the last two months in sixteen autopsies he found streptococcus hæmolyticus in 100 per cent., in the majority of cases in pure culture, and the influenza bacillus in only 12.5 per cent. of cases. This writer concludes that certain organisms which have merely a secondary relation to the disease, by developing increased virulence and pathogenicity, may appear in a later period as the prime factor. The chief difficulty in the determination of the essential cause of the disease appears to lie in the fact that the original cause, whatever its nature, paves the way for invasion by numerous secondary organisms, the latter completely overshadowing or crowding out the primary organism by the time the patients come under observation or at the time of the study.

Considerable significance has been attached to the finding of the influenza bacillus in the sputum and nasopharyngeal swabs from patients in various stages of the disease. The importance of such observations has been greatly weakened by the studies of Pritchett and Stillman (*Jour. Exper. Med.,* March 1, 1919, 29, No. 3, p. 259) who report that while they found the influenza bacillus in 93 per cent. of their patients suffering from influenza and bronchopneumonia, frequently in association with the pneumococcus, they also succeeded in isolating the organism from the sputum in 43 per cent. of the normal individuals studied. A review of the former studies showing influenza bacilli in normal throats and in the throats of those suffering from various diseases has been contributed by Kinsella (*Jour. Amer. Med. Assoc.,* March 8, 1919, 72, No. 10, p. 717).

Human experiments with cultures of the influenza bacillus by Yamanouchi, Sakakami and Iwashima (*Lancet,* June 7, 1919, 2, No. 4997, p. 971) proved negative in the fourteen persons whose nose and throat they injected with the influenza bacillus in pure culture and combined with the organisms frequently found associated with it. Their experiment suggests that the influenza bacillus does not possess that high degree of virulence which the widespread character and severity of the infection would indicate as being a peculiarity of the etiological factor in the recent pandemic. The negative results obtained in the two extensive experiments carried out by the United States Public Health Service and United States Navy (*U. S. Public Health Report,* 34, No. 33, January 10, 1919; Rosenau, *Jour.*

Amer. Med. Assoc., August 2, 1919, 73, No. 5, p. 311) with the object of determining the possibility of transmitting influenza to human beings would also seem to cast considerable doubt on the influenza bacillus as the etiological factor. Their results with secretions from the upper air passages and blood from typical cases of influenza also failed absolutely to support the findings of the investigators who have supported the filtrable virus as the cause of the disease.

Accepting the view that the essential cause of the infection has not been definitely discovered, in spite of the numerous advocates of the influenza bacillus and filtrable virus as the etiological factor, there can be no question that the pneumococcus, the influenza bacillus and the streptococcus hæmolyticus played an extremely important part in the production of the pulmonary manifestations, septicæmia and other complications of the disease, and must be held responsible for a certain proportion (probably a large majority) of the deaths which occurred during the pandemic. With these three organisms one should possibly include the micrococcus catarrhalis, Friedlander's bacillus, staphylococcus aureus and several other organisms whose identity is not so firmly established.

Prophylactic Vaccine.—The estimation of the value of prophylactic vaccination is attended with the greatest difficulty, as we are dealing with a disease of uncertain etiology and varying virulence. The reports upon the use of various vaccines are frequently based upon a small number of cases, or else the experiments are not properly controlled, rendering them valueless. The writers are frequently carried away by their enthusiasm, which leads them to express favorable opinions in regard to the value of certain vaccines, which are not supported by facts. An excellent critical review of numerous reports on the value of various vaccines has been published by McCoy (*Jour. Amer. Med. Assoc.,* August 9, 1919, 73, No. 6, p. 401), who concludes that " the general impression gained from uncontrolled use of vaccines is that they are of value in the prevention of influenza; but in every case in which vaccines have been tried under perfectly controlled conditions, they have failed to influence in a definite manner either the morbidity or the mortality."

The Special Committee of the American Public Health Association in their report on Influenza (*Jour. Amer. Med. Assoc.,* December 21, 1918, 71, No. 25, p. 2068) state that the evidence that has

come to their attention relative to the value of vaccines in prophylaxis against influenza is contradictory and irreconcilable, and comment on the need of more data obtained under carefully controlled conditions.

In view of the prevailing uncertainty in regard to the value of this means of preventing influenza a few of the findings of certain investigators will be mentioned without comment.

A vaccine made of mixed virulent strains of a hæmolytic streptococcus which they isolated has been employed by Ely, Lloyd, Hitchcock and Nickson (*Jour. Amer. Med. Assoc.,* January 4, 1919, 72, No. 1, p. 24) in 4212 cases, the results being compared to 8486 individuals under similar conditions who were not vaccinated. Employing a vaccine containing pneumococci, hæomlytic streptococci, staphylococci and the green-producing diplostreptococcus, Rosenow (*Jour. Amer. Med. Assoc.,* August 9, 1919, 73, No. 6, p. 396) reports on 93,476 complete inoculations. On the Pacific coast a noteworthy degree of protection was afforded by the use of a vaccine containing the influenza bacillus, pneumococcus and hæmolytic streptococcus, according to Minaker and Irvine (*Jour. Amer. Med. Assoc.,* March 22, 1919, 72, No. 12, p. 847). A " mixed catarrhal vaccine " was employed by Eyre and Lowe (*Lancet,* April 5, 1919, 2, No. 4988, p. 553), 16,104 individuals receiving full prophylactic doses. An experimental study was conducted by the Massachusetts State Department of Health, reported by Hinton and Kane (*Tenn. State Med. Assoc. Jour.,* April, 1919, 11, No. 12, p. 442), with a vaccine containing two strains of influenza bacillus. The results were entirely negative in spite of the fact that the inoculations were made in an institution in which influenza had not yet made its appearance. In New York State the influenza bacillus (15 strains) vaccine also failed to give reliable protection against influenza or influenzal pneumonia, according to Wadsworth (*Public Health Journal,* Toronto, July, 1919, 10, No. 7, p. 309). The polyvalent streptococcus vaccine which Cadham employed (*Lancet,* May 24, 1919, 2, No. 4995, p. 885) impressed him as being of value. A small series of cases (three hundred and ninety), carefully controlled, however, were inoculated by McCoy, Murray and Teeter (*Jour. Amer. Med. Assoc.,* December 14, 1918, 71, No. 24, p. 1997) with a vaccine containing bacillus influenzæ, streptococcus hæmolyticus, staphylococcus pyogenes aureus and four types of pneumococcus. The number developing influenza, those de-

veloping pneumonia and the number of deaths was slightly higher in the vaccinated than in those unvaccinated (three hundred and ninety of each). They feel that on this evidence no protection was afforded by the vaccine.

The reason why investigators have been so persistent in their search for a prophylactic vaccination lies in the fact that an attack of influenza appears to confer immunity against the disease.

Pathology.—The descriptions of the pathological anatomy of influenza cover such a large field that it is impossible to attempt to summarize them in a review of this kind. The subject is further complicated by the fact that the conditions vary with the stage of the disease, that lobar and bronchopneumonia are frequently grouped together and that secondary invaders alter the anatomical picture, according to the type of organism responsible. The disease, in the opinion of Le Count (*Jour. Amer. Med. Assoc.,* March 1, 1919, 72, No. 9, p. 650) possesses so many distinctive features and affords so much of novelty in pathology that he finds it difficult to believe that it can fail to possess a corresponding definite etiology. He has also described (*Jour. Amer. Med. Assoc.,* May 24, 1919, 72, No. 21, p. 1519) microscopic disseminated necrosis of the pulmonary capillaries which he believes may play a part in the production of the hemorrhages and œdema in this disease. A description of the pneumonia following influenza is contributed by MacCallum (*Jour. Amer. Med. Assoc.,* March 8, 1919, 72, No. 10, p. 720), who states that the types caused by the pneumococcus, streptococcus and influenza bacillus are to be sharply distinguished, and that possibly the type caused by the staphylococcus will be shown to have distinctive peculiarities. Tracheobronchial glandular disease, as possibly a sequel to influenza, has been noted by Méry and his collaborators (*Bull. de la Soc. Med. des Hop.,* May 16, 1919, 43, No. 17, p. 471) in making radiologic studies; and Jean (*Presse Méd.,* June 12, 1919, 27, No. 33, p. 320) reports on adenophlegmon of the hilum in this disease. Latent infection of the hilum following influenza has also been studied clinically by Arnold (*Jour. Amer. Med. Assoc.,* May 10, 1919, 72, No. 19, p. 1363) and Wilson (*Lancet,* January 25, 1919, 2, No. 4978, p. 137).

Clinical Features.—The descriptions of the clinical features of the disease are exceedingly difficult to correlate on account of the

great diversity of symptoms and signs described. In most of the reports no effort has been made to differentiate the symptoms as occurring in uncomplicated influenza, influenzal pneumonia, and pneumonia due to pneumococcus or streptococcus. It is, therefore, difficult to determine what significance is to be attached to the various symptoms and signs described.

The onset of the disease varies, but it is abrupt in the great majority of the cases (Connor, *Jour. Amer. Med. Assoc.,* August 2, 1919, 73, No. 5, p. 321), three distinct types of invasion being noted by Bloomfield and Harrop (*Bull. Johns Hopkins Hosp.,* January, 1919, 30, No. 335, p. 1)—abrupt, gradual and intermittent. The appearance of the mouth was remarkably constant, being characterized by a bright vermilion or scarlet injection of the pharynx, tonsils, pillars and soft palate during the first twenty-four hours, in many cases the entire mouth cavity having a flaming appearance. In from one-half to two-thirds of the cases at onset, one or more dark crimson spots were seen on the mucosa of the inside of the cheek, which fade and disappear rapidly. Another striking feature was a swelling of the minute nodules normally present on the soft palate. Symptoms that have been reported by other writers are: cough; hoarseness, epistaxis (25 per cent.); mental dulness; turgid, flushed appearance of the face and occasionally distinct erythema which at times spread over the upper chest and neck; herpes, petechiæ, and sweating; pain and stiffness on movement of the eyeball, with occasional photophobia; cyanosis; delirium; jaundice; hiccup; and general lymph gland enlargement. The types of disease have been described by Atiles (*Bol. de la Assoc. Med. Puerto Rico,* December, 1918, 14, No. 121, p. 279), grouping them under respiratory, gastrointestinal and nervous forms, the first-mentioned predominating. An intestinal choleriform type was noted with comparative frequency by de Bellard (*Brazil Med.,* January 31, 1919, 26, No. 2, p. 18).

The temperature was usually irregular and remittent in type, unlike the regular plateau of elevation seen in lobar pneumonia (Rackemann and Brock, *Arch. Int. Med.,* May 15, 1919, 23, No. 5, p. 582), and not infrequently a deceptive remission occurred on the third day (Stone and Swift, *Jour. Amer. Med. Assoc.,* February 15, 1919, 72, No. 7, p. 487). Several observers call attention to the low respiratory and pulse rates with high temperature, Ruiz (*Gac.*

med. de Caracas, November 30, 1918, 25, No. 22, p. 233) believing the low pulse rate of good prognostic significance.

Bleeding during the disease was noted by several of the observers as being a rather common symptom, not only epistaxis and hæmoptysis, but also metrorrhagia and petechia occurring in some cases. Several observers also comment on the relative frequency with which the left lower lobe was the portion of the lung most frequently and most markedly affected.

In patients whose symptoms had developed within twenty-four hours and in which there were no physical signs of consolidation, Stine (*Mo. Med. Assoc. Jour.,* May, 1919, 16, No. 5, p. 164) found cog-wheel breathing or harsh inspiratory whiff in 83 per cent. of the three hundred cases examined. He believes it may be distinguished from the harsh breathing heard over beginning consolidation, and is a sign of importance in diagnosing influenza.

Blood Counts.—Practically every observer who made a study of the leukocytes has commented upon the leukopenia, which appears to have been characteristic of the early uncomplicated influenzal period. This decrease in the number of leukocytes appears to have been made at the expense of the polymorphonuclear leukocytes (Conner, *Jour. Amer. Med. Assoc.,* August 2, 1919, 73, No. 5, p. 321; Levinson, *Jour. Infect. Dis.,* July, 1919, 25, No. 1, p. 18).

Accepting the leukopenia with lymphocytosis as characteristic of the uncomplicated influenzal infection, Levinson (*Jour. Infect. Dis.,* July, 1919, 25, No. 1, p. 18) suggests that there may be two types of pneumonia complicating influenza, one due to the organism causing the original infection, in which the leukopenia persists, and another type in all probability the result of secondary infection, associated with a leukocytosis. This leukopenia may be as low as eighteen hundred or three thousand (Ross and Hund, *Jour. Amer. Med. Assoc.,* March 1, 1919, 72, No. 9, p. 640), becoming lower as the disease progressed, the count rising in cases improving after transfusion. In a careful study of a large number of leukocyte counts (688), Keeton and Cushman (*Jour. Amer. Med. Assoc.,* December 14, 1918, 71, No. 24, p. 1962) found a leukopenia or normal count in over 50 per cent. of the early cases of influenza, but with recovery this changed to a leukocytosis of from nine thousand to fifteen thousand. Primary influenzal bronchopneumonia was accompanied by a low aver-

age count (5000 to 15,000), as noted by Rackemann and Brock (*Arch. Int. Med.*, May 15, 1919, 23, No. 5, p. 582), the average count tending to increase slightly (5000 to 30,000 or higher) with the presence of hæmolytic streptococci. Several cases were observed with counts below two thousand cells, all of which were fatal. Leukopenia was practically always present in the influenzal stage of the cases studied by Brem, Bolling and Casper (*Jour. Amer. Med. Assoc.*, December 28, 1918, 71, No. 26, p. 2138), the leukopenia persisting in the fatal pneumonia cases, and a leukocytosis appearing in the cases that recovered. Leukocytosis is regarded by Dever, Boles and Case (*Jour. Amer. Med. Assoc.*, January 25, 1919, 72, No. 4, p. 265), as an evidence of complications, their uncomplicated cases averaging 7782 and the complicated 15,906. In blood counts of eighty patients with influenzal bronchopneumonia, Lamb and Brannin (*Jour. Amer. Med. Assoc.*, April 12, 1919, 72, No. 15, p. 1056) found an average of 6780, with nothing remarkable in the differential count.

Complications.—The various complications that have been recorded as occurring during influenza nearly cover the field of internal medicine. Accepting bronchopneumonia as a complication, rather than as a feature of the initial disease, it must be accepted as by far the most frequent.

Next to bronchopneumonia the complication which occurred most frequently, in most of the reports, was empyema or otitis media, the latter occasionally associated with mastoiditis. Pleural effusions, a certain proportion of which later developed pus, were not uncommon, and occasionally pneumothorax. Rarer complications were rupture of rectus muscles, antrum and sinus infections, cervical adenitis, superficial infections, ulcerative stomatitis, osteomyelitis and arthritis. Parotitis was not uncommonly observed and thrombophlebitis and subcutaneous emphysema occasionally occurred.

The respiratory tract was naturally the seat of complications which in many instances were exceedingly serious. The larynx was at times ulcerated, leading in some cases to acute laryngeal obstruction, the latter being seen more especially in children, in some instances being due to a pseudomembranous exudate. A curious phenomenon which occasionally occurred among the bronchopneumonia cases was generalized pulmonary emphysema (Torrey and Grosh, *Amer. Jour. Med. Sc.*, February, 1919, 157, No. 2, p. 170). This

emphysema was at times of an interstitial type, associated with generalized subcutaneous emphysema and spontaneous pneumothorax (Berkley and Coffen, *Jour. Amer. Med. Assoc.*, February 22, 1919, 72, No. 8, p. 535; La Fetra, *Amer. Jour. Med. Sc.*, June, 1919, 157, No. 6, p. 770; Myquist, *Med. Rec.*, August 30, 1919, 96, No. 9, p. 353). In some of the epidemics purulent bronchitis was an exceedingly frequent complication, and a few instances of bronchiectasis and pulmonary abscess are recorded. Pulmonary œdema was an exceedingly frequent terminal feature in the pneumonia cases.

While many cases showed the presence of albumin and casts during the course of the pneumonia, actual nephritis was relatively uncommon (Conner, *Jour. Amer. Med. Assoc.*, August 2, 1919, 73, No. 5, p. 321).

Myocardial changes were remarkably infrequent even in the severe pneumonias (Cowie and Bevan, *Mich. State Med. Soc. Jour.*, February, 1919, 18, No. 2, p. 41), in fact the relative infrequency of serious cardiac complications was rather striking (Conner, *Jour. Amer. Med. Assoc.*, August 2, 1919, 73, No. 5, p. 321), although auricular fibrillation and heart block were occasionally observed and several cases of endocarditis have been reported.

Abdominal complications have not been uncommon, manifesting themselves in the form of abdominal rigidity and tenderness, peritonitis, subphrenic abscess, jaundice, simulated acute appendicitis, intestinal hemorrhages and duodenal ulcer.

The multiform, organic and functional, central and peripheral, nervous manifestation of influenza are reviewed by Dragotti (*Policlinico,* February 9, 1919, 26, No. 6, p. 161), to which he adds epilepsy, chorea, hysteria and neurasthenia. He also describes at length the psychoses developing during the acute period and during convalescence. They cannot, however, be considered as a frequent complication, Fell (*Jour. Amer. Med. Assoc.*, June 7, 1919, 72, No. 23, p. 1659) reporting only four cases, out of twenty-five hundred, which developed psychoses of a severe type which outlasted the acute disease, the most common symptom being depression.

Numerous observers have reported the appearance of symptoms simulating those of meningitis occurring during influenza, although they comment on the fact that the spinal fluid was negative in the

large majority of cases and post-mortem examination usually failed to reveal any inflammation of the brain or its meninges.

A frequent observation as a sequel to the disease is that of alopecia, which all the writers state is not specific but is merely a post-febrile alopecia with an excellent prognosis. The diagnosis of empyema seems to have received very little attention in the literature, except for the assistance which may be received from the X-ray (Boggs, *Amer. Jour. Röntgenology*, May, 1919, 6, No. 5, p. 239).

One of the most serious features of the epidemic was the effect of the infection upon *pregnant women*, at least in the cases which developed pulmonary involvement. The frequency with which pregnancy was interrupted was very noticeable, Woolston and Conley (*Jour. Amer. Med. Assoc.*, December 7, 1918, 71, No. 23, p. 1898) report a termination of pregnancy in 75 per cent. of the fatal cases (fifty-two), and in 42.7 per cent. of those recovering (forty-nine). In their one hundred and one pregnant women, 59 per cent. miscarried, and there was a death rate of 51.4 per cent., compared to a mortality of 33.3 per cent. among the patients in the general hospital. Interruption of pregnancy is also reported by Andérodias (*Rev. Mens. de Gyn. et d'Obstet.*, June, 1919, 14, No. 6, p. 201), Calderon (*Jour. Amer. Med. Assoc.*, September 27, 1919, 73, No. 13, p. 982), Abt (*Jour. Amer. Med. Assoc.*, April 5, 1919, 72, No. 14, p. 980), Titus and Jamison (*Jour. Amer. Med. Assoc.*, June 7, 1919, 72, No. 23, p. 1665), Bircher (*Corr.-Blatt f. Schw. Aerzte*, October 5, 1918, 48, No. 40, p. 1338) and Bland (*Amer. Jour. Obstet. and Dis. Women and Children*, February, 1919, 79, No. 2, p. 184).

Treatment.—The multiplicity of drugs and remedial measures suggested for the treatment of influenza and influenzal pneumonia is a very good indication of the lack of any reliable form of treatment, nearly everything suggested being for the relief of definite symptoms. Practically every writer insists on the importance of absolute *rest*. *Hydrotherapy* has also been recommended by numerous writers, especially in the form of cold or hot packs. Water, internally, by mouth or by rectum, is of value, according to Rackemann and Brock (*Arch. Int. Med.*, May 15, 1919, 23, No. 5, p. 582) in combating the toxæmia. Some have resorted to intravenous injections of sugar, normal salt solution or Locke's solution (Rood, *N. Y. Med. Jour.*, March 22, 1919, 109, No. 12, p. 493). *Bleeding* has also been employed with

benefit in certain cases, especially in those showing cyanosis and pulmonary œdema.

There seems to be some difference of opinion in regard to the use of the *salicylates,* some recommending them as harmless palliatives, while others believe those that abstain from salicylates seem to get along **better.**

Alcohol in the treatment of this disease seems generally to be regarded as of very little if any value or distinctly contraindicated.

Opium seems to have been freely administered by many observers throughout the disease. *Digitalis* proved to be of considerable value to many of the writers (Herrick; Bassoni; Rackemann and Brock, *v.s.*), and *camphor* was very generally employed by most observers and was regarded as of considerable value by many. *Caffein* was employed by several writers during critical periods, but Lereboulet (*Paris Méd.,* October 12, 1918, 8, No. 41, p. 399) warns that it is liable to bring on delirium. *Atropin* has been employed by some of the observers, especially in the cases showing beginning œdema of the lungs.

Fixation abscess in the treatment of this disease is viewed by a number of writers as an important adjuvant to the ordinary measures of treatment (Vergely, *Jour. de Med. de Bordeaux,* February 15, 1919, 90, No. 3, p. 57; Wanner, *v.s.;* Richet and Barbier, *Annales de Med.,* May, 1919, 6, No. 1, p. 37; Merklen, *v.s.,* and Ravaut, *v.s.*). *Lung puncture,* aiming at determining a local accumulation of polymorphonuclear leucocytes and so stimulating phagocytes by setting up a focus of irritation in the pneumonic areas, has been employed by Benaroya (*Lancet,* May 2, 1919, 1, No. 4992). In employing this method Rood (*N. Y. Med. Jour.,* March 22, 1919, 109, No. 12, p. 493) noted that relief was most marked in the cases in which pneumothorax resulted from the procedure, and he, therefore, tried *artificial pneumothorax* in three apparently hopeless cases, with the recovery in two of them.

Specific.—*Convalescent human serum* has been employed by a number of investigators in the treatment of influenza with varying results. One of the most optimistic reports on the use of pooled serum from convalescent influenza bronchopneumonia patients is contributed by McGuire and Redden (*Jour. Amer. Med. Assoc.,* March 8, 1919, 72, No. 10, p. 709), who relate their further experience with this method of treatment in one hundred and fifty-one cases. They

have found that it has greatly reduced the mortality (3.9 per cent),
shortened the course of the disease, and has proved almost a specific,
not only during a waning epidemic, but also during a severe recru-
descence of the outbreak. The toxæmia of influenza seems to be neu-
tralized by the plasma from convalescent patients, according to O'Mal-
ley and Hartman (*Jour. Amer. Med. Assoc.,* January 4, 1919, 72,
No. 1, p. 34), who have employed this method in forty-six cases
of influenzal pneumonia, with a mortality rate of 6.5 per cent.,
compared to a death rate of 25.2 per cent. in one hundred and
eleven untreated cases. Thirty cases have been treated by this method
by Gould (*N. Y. Med. Jour.,* April 19, 1919, 109, No. 16, p. 666)
with two deaths (6.6 per cent.), while the rate among three hun-
dred and twenty cases treated by other methods showed a death
rate of 26.16 per cent. The rapid and complete subsidence of symp-
toms, unusual in most cases of influenzal pneumonia, gave hope that
a specific line of treatment had been found. Favorable clinical results
followed the employment of this method of treatment by Liebmann
(*Corr.-Blatt f. Schw. Aerzte,* October 19, 1918, 48, No. 42, p. 1393)
and Kahn (*Jour. Amer. Med. Assoc.,* January 11, 1919, 72, No. 2, p.
102). In contrast with the preceding reports, Ehrenberg (*Hygiea,*
February 15, 1919, 81, No. 3, p. 113) was disappointed in the results
of intravenous injection of 40 c.c. of convalescent serum in twenty
cases of influenza, and Stine (*Mo. State Med. Assoc. Jour.,*
January, 1919, 16, No. 1, p. 10) was doubtful of its value. Other
investigators have employed *whole citrated blood* from convalescents,
instead of serum only. Employing this method of treatment in
twenty-eight cases of influenzal pneumonia, Ross and Hund (*Jour.
Amer. Med. Assoc.,* March 1, 1919, 72, No. 9, p. 640) had a death
rate of one-half (21.4 per cent.) that of twenty-one cases treated symp-
tomatically (42.8 per cent.). A decidedly beneficial effect followed
this method of treatment, according to McLachlan and Fetter (*Jour.
Amer. Med. Assoc.,* December 21, 1918, 71, No. 25, p. 2053), espe-
cially when given early in the disease.

The results obtained by the employment of mixed *vaccines* are
far from uniform. A mixed vaccine was employed by Champtaloup
and Drennan (*Med. Jour. Australia,* January 25, 1919, 1, No. 4)
which they believe was of extreme value in controlling the disease and
limiting complications. This form of treatment was attended with

success in the hands of Russell (*Lancet,* April 26, 1919, 2, No. 4991, p. 689), Tottenham (*Brit. Med. Jour.,* January 11, 1919, 1, No. 3028) and Black-Milne and Rogers (*Lancet,* October 25, 1919, 2, No. 5017, p. 731). The disease was modified, so that a lower mortality resulted in the severe cases by a vaccine administered by Eagleton and Butcher (*Lancet,* April 5, 1919, 2, No. 4988, p. 560), although it conferred no immunity to serious complications. Among the sixty cases which Bezançon and Legroux (*Bull. de l'Acad. de Med.,* January 14, 1919, 81, No. 2, p. 44) treated with a polyvalent mixed vaccine, the mortality was only 8 per cent., while in the twenty-five not given this treatment the mortality was 17.8 per cent. If the vaccine treatment is administered within a few hours of the onset of the disease, Wynn (*Practitioner,* February, 1919, 102, No. 2, Part 2, p. 77) found that the attack of influenza will be definitely aborted. The development of pneumonia in severe influenza was favorably affected by intensive treatment with a sensitized pneumostreptococcus vaccine in the hands of Houda (*Northwest Med.,* December, 1918, 17, No. 12, p. 336). The results from the use of vaccine Rackemann and Brock (*Arch. Int. Med.,* May 15, 1919, 23, No. 5, p. 582) found to be unsatisfactory during an epidemic at Camp Merritt. Encouraging success in the treatment of influenza with autogenous vaccines is reported by Casabo (*Rev. de Med y Cir.,* Havana, January 25, 1919, 24, No. 2). The *intravenous injection* of a mixed influenza vaccine was attended by very striking results in numerous instances, Roberts (*Amer. Jour. Med. Sc.,* September, 1919, 158, No. 570, p. 397) being convinced that many cases recovered promptly which would otherwise have terminated fatally. A careful analysis of their results following the intravenous injection of a mixed bacterial vaccine has forced Roberts and Cary (*Jour. Amer. Med. Assoc.,* March 29, 1919, 72, No. 13, p. 922) to the conclusion that their method of treatment in influenza has a very definite therapeutic value.

In the treatment of complications Bircher (*Corr.-Blatt f. Schw. Aerzte,* October 5, 1918, 48, No. 40, p. 1338) found antipneumococcus serum was of benefit where pneumococci were found, but antistreptococcus serum proved ineffectual. It is the belief of Stone and Swift (*Jour. Amer. Med. Assoc.,* February 15, 1919, 72, No. 7, p. 487) that not much may be expected in the specific treatment of pneumonia of the type associated with the presence of the hæmolytic

streptococcus until a potent antiserum for the various strains of this organism has been produced.

Non-specific proteins in the treatment of influenza have been employed in such a limited number of cases that it is impossible to estimate their value at the present time. This form of treatment is not to be recommended for general use in a disease of this kind until we have become more familiar with this procedure, as the conditions are not comparable to those prevailing in arthritis, the process in which this method has been chiefly employed.

PNEUMONIA

Type of Organism.—The type of pneumococcus responsible for the pneumonia in a patient is of such importance, not only from the prognostic, but also from the therapeutic standpoint, that any method for accurately determining the type is of considerable interest. A new method for determining the type of pneumococcus by the study of the reaction between the laked blood of the patient and saline emulsion of cultures of proved Types I, II, and III pneumococci, has been devised by Loewe, Hirshfeld and Wallach (*Jour. Amer. Med. Assoc.*, July 19, 1919, 73, No. 3, p. 170). They have made a comparison between their method and those based on determination of type from sputum, by Avery's method, and with precipitin tests, and they believe their method is simple and unmistakable and is preferable to and more accurate than methods depending upon the sputum.

The reports on the type of organism found are of interest from the standpoint of contagion, especially in regard to Types I and II pneumococci. Where Types II atypical, III and IV predominate it would appear as though there had been some factor which had reduced the resistance of the individual to these organisms frequently found in the mouths of healthy individuals.

In an examination of the sputum of one hundred and thirty-four healthy individuals at Camp Funston, Opie and his co-workers (*Jour. Amer. Med. Assoc.*, January 11, 1919, 72, No. 2, p. 108) found sixty-five per cent. showed the presence of pneumococci, among these eighty-seven men the organisms were distributed as follows: Type I, 2.3 per cent; Type II, none; Type IIa, 8.0 per cent; Type III, 10.3 per cent., and Type IV, 79.3 per cent. Among six hundred men examined by Birge and Havens (*N. Y. Med. Jour.*, March 29, 1919,

109, No. 13, p. 544) 2 per cent. were found to be harboring Type III organisms, which they believe accounted for the high proportion of Type III pneumonias, which equalled the Type IV pneumonias in number.

A review of the various reports on the types of pneumococci responsible for the bronchopneumonia which followed influenza and other acute diseases, shows the Type IV predominated in every study, forming 75 to 85.8 per cent. of the pneumococci present. In lobar pneumonia, however, the proportion of Types I and II were much higher, forming 13.1 to 39.1 per cent. of the pneumococci, while the Type IV was correspondingly less, forming 24 to 56.3 per cent.

Prophylactic Vaccination.—Prophylactic vaccination against pneumonia has been further developed, and the results obtained indicate that this procedure will eventually prove of considerable value in the control of this all-too-prevalent disease. A saline pneumococcus vaccine containing Types I, II and III was employed by Cecil and Austin (*Jour. Exper. Med.,* July, 1918, 28, p. 19) in inoculating twelve thousand seasoned troops, and in the period of ten weeks covered by their observation no cases of pneumonia of these types developed among the vaccinated, while twenty-seven cases of these types developed among the unvaccinated. Only seventeen cases of pneumonia of all types (including Type IV and streptococcic) developed among the vaccinated as compared to one hundred and seventy-two cases among the unvaccinated. Among more recent recruits, Cecil and Vaughan (*Jour. Exper. Med.,* May 1, 1919, 29, No. 5, p. 457), employing a lipovaccine, found the results were not so striking, but even here the incidence of pneumonia was twice as great among the unvaccinated, among seasoned troops the incidence being seven times as great. The development of vaccination against pneumonia has been reviewed by Fennel (*Jour. Amer. Med. Assoc.,* December 28, 1918, 71, No. 26, p. 2115), who describes this lipovaccine which he claims has slight toxicity, may be given in one injection, and the usefulness of which is indicated by the early reports.

Treatment.—The treatment of pneumonia by antipneumococcus serum of definite type, especially Type I and to a less extent Type II, continues to give good, if not very striking, results (Gould and Shaweker, *U. S. Naval Med. Bull.,* January, 1919, 13, No. I, p. 16; Hart, *Med. Rec.,* May 31, 1919, 95, No. 22, p. 895), the develop-

ment of this method of treatment being thoroughly described in an article by Redden (*U. S. Naval Med. Bull.,* January, 1919, 13, No. 1, p. 35). The early employment of polyvalent serum in pneumonia, Camac (*Amer. Jour. Med. Sc.,* December, 1918, 156, No. 6, p. 887) believes, was responsible for the preventing of development or clearing of the blood-stream of pneumococcus organisms. He also employed Type I serum when indicated. Highly favorable results in generalized pneumococcus infections are also reported by Lassance (*Presse Méd.,* January 23, 1919, 27, No. 4, p. 30) and Truche (*Bull. de l'Acad. de Med.,* June 17, 1919, 81, No. 24, p. 823) following the employment of antipneumococcus serum. Type I serum and polyvalent serum were administered to one hundred and fifty-eight pneumonia patients by Brown and Palfrey (*N. Y. Med. Jour.,* August 23, 1919, 110, No. 8, p. 316). Among the pure Type I cases the mortality was 10.6 per cent., and in all cases showing Type I, either alone or associated with another type, the mortality was 9.7 per cent.

Convalescent serum has been employed by Humbert (*Med. Rec.,* December 7, 1918, 94, No. 23, p. 985) in eleven cases with one death, due to Type III infection; and striking results followed the employment of normal (not convalescent) serum in the one case in which Cannon (*Southern Med. Jour.,* September, 1919, 12, No. 9, p. 523) employed it.

A carefully controlled study has been made by Head (*Jour. Amer. Med. Assoc.,* May 3, 1919, 72, No. 18, p. 1268) of the open-air or open-ward treatment of pneumonia, which he believes warrants the conclusion that the closed ward, no-chilling management of the pneumonia complicating influenza should be more generally employed, as the patients treated by this method showed a mortality of only 3.2 per cent., compared to 13.9 per cent. among those treated by the open-ward, cold-air method.

STREPTOCOCCUS INFECTIONS

There are probably many different varieties of organism grouped under the heading streptococcus hæmolyticus and efforts are being made to provide methods for the differentiation of the varieties one from another. The work of Avery, Dochez and Lancefield (*Annals of Ot., Rhin. and Laryngology,* June, 1919, 28, No. 2) and Hamilton and Havens (*Jour. Amer. Med. Assoc.,* January 25, 1919, 72, No. 4,

p. 272) are of special interest from their addition to our knowledge on this subject. There is still some question as to the part played by this organism in the acute respiratory infections, whether primary or secondary to some other infective agent, as in influenza and following measles. It has been demonstrated that they are a not uncommon finding in the tonsils of apparently healthy individuals, as well as those suffering from systemic infections or toxæmias. It is important to determine whether the acute respiratory infections are the result of infection from the patient's own organisms, or by a more virulent strain from some other individual. This whole problem is very thoroughly covered by Davis (*Jour. Amer. Med. Assoc.*, February 1, 1919, 72, No. 5, p. 320) who considers it reasonable to assume that individuals are being infected from time to time with their own streptococci, especially following the contagious diseases, and that by this process the streptococci become more and more virulent and aggressive, reaching a point ultimately at which the small doses contained in infected droplets, or in other vehicles, are sufficient to transmit the disease to a normal person. Thus a secondary invader may become transformed into a dangerous primary infective agent. At Camp Custer the streptococci manifested themselves almost uniformly as secondary invaders, according to Blanton, Burhans and Hunter (*Jour. Amer. Med. Assoc.*, May 24, 1919, 72, No. 21, p. 1520), but in an epidemic of bronchopneumonia due to streptococcus hæmolyticus studied by Goodpasture (*Jour. Amer. Med. Assoc.*, March 8, 1919, 72, No. 10, p. 724), it was regarded by him as primary streptococcal pneumonia.

The relation of streptococcus hæmolyticus *carriers* to streptococcus epidemics in the army has been studied by Blake (*Annals of Ot., Rhin. and Laryng.*, June, 1919, 28, No. 2, 361), who believes that the widespread streptococcus infections have been due, in a very large part, to invasion of virulent streptococci in individuals rendered susceptible by predisposing diseases through contact infection, either direct or indirect, and that autogenous infection had played an insignificant rôle in the production of these streptococcus infections. The work of Lucke and Rea (*Jour. Infect. Dis.*, June, 1919, 24, No. 6, p. 533) in studying the relationship between the streptococci isolated from the throat and from empyemata, gives additional support to the belief that the streptococcus carrier state is an indica-

tion of the possibility of complications in respiratory tract diseases. With a recognition of the dangers of the streptococcus hæmolyticus carrier state, the methods for the eradication of this organism from the tonsils assume considerable importance. Chemical means of disinfection can never reach all of the crypts harboring these streptococci, according to Bryan (*Annals of Ot., Rhin. and Laryng.,* June, 1919, 28, No. 2, p. 337), who urges a complete enucleation of the tonsil of the streptococcus carriers.

TUBERCULOSIS

Diagnosis.—The diagnosis of advanced pulmonary tuberculosis is generally looked upon as an easy matter, with very slight chance of error, but McCrae and Funk (*Jour. Amer. Med. Assoc.,* July 19, 1919, 73, No. 3, p. 161) have compiled a number of cases from their experience which show that this is not always the case.

Among the men engaged in active warfare there were many who were returned, especially among the French, with the diagnosis of pulmonary tuberculosis, approximately 50 per cent. of which were found to be suffering from conditions simulating tuberculosis. Eleven hundred of these cases were examined by Delherm (*Paris Méd.,* February 1, 1919, 9, No. 5, p. 96), six hundred and ninety-four (63 per cent.) of them proving to be exempt from tuberculosis, Détré (*Presse Méd.,* July 10, 1919, 27, No. 39, p. 384) found 80.2 per cent. non-tuberculous among eight hundred and forty-four suspects, and Roubier (*Progrès Méd.,* June 14, 1919, 34, No. 24, p. 229) over 50 per cent. among one thousand. The final decision in these reports rested upon the result of Röntgen examination, Mantoux (*Presse Méd.,* November 11, 1918, 26, No. 62, p. 570) laying greater stress upon radiography than upon radioscopy. The X-ray has been employed more and more in the study of the chest, some of the observers going so far as to consider any examination of the chest as incomplete which does not include this method of examination (Dunham, *Amer. Rev. Tuberc.,* November, 1918, 2, No. 9, p. 551). The clinical and Röntgen findings harmonized in 90 per cent. of the cases with actual tuberculous lesions at the apex, in the series of cases studied by Roubier (*Progrès Méd.,* June 14, 1919, 34, No. 24, p. 229), but the Röntgen-rays always revealed more extensive lesions.

The employment of Röntgen examinations in the early diagnosis

of tuberculous colitis is advocated by Brown and Sampson (*Jour. Amer. Med. Assoc.,* July 12, 1919, 73, No. 2, p. 77).

There is probably no more valuable addition to our knowledge of tuberculosis in recent years than that relating to the frequency of the infection in early life, and the significance of tuberculous disease in children. The diagnosis of the presence of tracheobronchial adenopathy is very unsatisfactory or impossible by the customary clinical methods of examination, dependence being placed upon Röntgen examinations, according to Garrahan and Dastugue (*Rev. de la Asoc. Med. Argent.,* November, 1918, 29, No. 168, p. 643), and Ribadeau-Dumas (*Progrès Méd.,* August 9, 1919, 34, No. 32, p. 312). The symptomatology and physical findings in one hundred and thirty-five children have been published by Moorman (*Oklahoma State Med. Assoc. Jour.,* May, 1919, 12, No. 5, p. 123), with the röntgenological findings in sixty-nine. The percussion findings in intrapulmonary tuberculous glands have been analyzed by Méry, Salin and Girard (*Bull. de la Soc. Med. des Hop.,* March 7, 1919, 43, No. 9, p. 188). Hilum tuberculosis is mainly a disease of childhood, but Rivière (*Lancet,* February 8, 1919, 2, No. 4980, p. 213) has applied this term to a certain type of tuberculosis which may be found in adults, and five cases of this disease, of a fulminating form, have been described by Dumas (*Lyon Med.,* April, 1919, 128, No. 4, p. 180), occurring in African soldiers at Salonica.

Complement Fixation.—The complement fixation in tuberculosis has continued to receive considerable attention, as it has been hoped that this procedure would provide the clinician with an accurate method of determining the presence or absence of active tuberculosis in a given case, our present methods of detecting the presence of activity being in many cases entirely inadequate.

The findings by the various investigators differ greatly, due possibly to variations in the technic employed. Stoll and Neuman (*Jour. Amer. Med. Assoc.,* April 12, 1919, 72, No. 15, p. 1043) believe the practical utility of the test is limited, as the highest percentage of positive reactions is obtained in the obvious cases. They, however, believe that with suspicious symptoms and suggestive signs a positive reaction probably signifies an active tuberculosis, but that with frank signs and symptoms, but no tubercle bacilli in the sputum, a negative test cannot outweigh the clinical evidence, advising a Wassermann test in

all such cases. Positive reactions were obtained by Brown and Petroff (*Amer. Rev. Tuberc.*, November, 1918, 2, No. 9, p. 525) in 26 per cent. of the non-tuberculous, and 51 per cent. of the incipient cases, the proportion increasing until they found 81 per cent. in advanced cases.

The technic of the test, with special reference to the antigens employed, has been described by Lewis (*Amer. Rev. Tuberc.*, May, 1919, 3, No. 3, p. 129), who concludes that the numerical relations are such as to make it unsafe to apply the reaction to the diagnosis of tuberculosis, except as a matter of the most limited confirmatory interest.

Prophylactic Vaccination.—Working on the theory that there are three stages in the development of the tubercle bacillus, Ferran (Madrid Letter, *Jour. Amer. Med. Assoc.*, October 4, 1919, 73, No. 14, p. 1074) has started his vaccination against this disease on a large scale, fourteen thousand having been given and five hundred revaccinations. It is too recent an experiment to attempt to estimate its practical value, although it has already received considerable attention in the medical literature. The work of Maragliano has been brought down to date in a recent contribution (*Riforma Med.*, July 5, 1919, 35, No. 27, p. 542), in which he reports on the present state of health of a large number of individuals he has vaccinated.

Treatment.—The results which one may expect from the treatment of tuberculosis by recognized methods, is a subject of the greatest interest, especially when the observations cover a large number of cases over a number of years. The *sanatorium treatment* of this disease has now been employed extensively for a sufficient length of time for us to accurately estimate not only the immediate results, but what is far more important, the ultimate results for a varying number of years after the patients have left the sanatorium.

Regardless of the method employed, there can be no question of the importance of early recognition of the disease, the measures we now possess being sufficient to cure practically every case if they could only be applied sufficiently early (Barlaro, *Prensa Med. Argent.*, September 10, 1918, 5, No. 10, p. 99).

The problem of *tuberculin* is still unsettled, some observers finding no results from its use (Medical Research Committee in London Letter, *Jour. Amer. Med. Assoc.*, October 4, 1919, 73, No. 14, p.

1075) and others publishing results of treatment, in which its influence, if any, was in all probability extremely limited (Waters and Peters, *Amer. Rev. Tuberc.,* March, 1919, 3, No. 1, p. 25). There are still investigators, however, who claim excellent results from the judicious use of this agent.

The complications which may arise during the course of pulmonary tuberculosis usually require the most careful treatment, as the combination of two diseases usually presents a delicate therapeutic problem, one which has always been dreaded by physicians being *diabetes mellitus* in the tuberculous. This subject has been carefully studied by Landis, Funk and Montgomery (*Amer. Rev. Tuberc.,* January, 1919, 2, No. 11, p. 690) in twelve cases, in all of which, with one exception, fast days were employed at various times during the course of the treatment.

Great care in the administration of arsphenamin for *syphilis* to tuberculous patients is urged by Elliott (*Amer. Jour. Syphilis,* April, 1919, 3, No. 2, p. 291), as a deleterious effect may result which only appears several months after the administration of this drug.

A method of treatment which has received considerable attention during the past year on account of the space accorded it in the lay press has been the so-called *" sugar treatment "* of tuberculosis. Lo Monaco is responsible for the application of these subcutaneous injections of sugar in tuberculosis, and he has brought the subject down to date (*Presse Méd.,* December 5, 1918, 26, No. 67, p. 617), describing the cases in which it may be of value and those in which it is contraindicated. One objection to the method is that the subcutaneous injections are painful, requiring the addition of a little cocain. He claims the effect is in no way specific, the injections not acting directly on the tubercle bacillus, the beneficial effect depending on the diminishing of the secretion. Its main usefulness in tuberculosis is in the cases in which the acute stage has passed and the chief symptoms are profuse expectoration and nightsweats, with little or no fever, but great debility and emaciation. He also finds this treatment useful in bronchiectasis, in asthma and in emphysema. The only effect noted from this treatment by von Schulthess-Rechberg (*Corr.-Blatt f. Schw. Aerzte,* April 12, 1919, 49, No. 15, p. 489), in the nine cases in which he employed it, was a decrease in the amount of sputum in most of the cases.

Hæmoptysis is always a trying complication and often taxes one's therapeutic ingenuity. Repose and tranquilizing measures were all that Lunde (*Norsk. Mag. f. Laeger.*, November, 1918, 79, No. II, p. 1253) found necessary to control hæmoptysis in thirteen of the twenty-four cases he reports. He obtained striking results from the injection of three cubic centimetres of a 20 per cent. camphorated oil. In the eleven cases in which he has tried it the hemorrhage has been arrested in a few minutes—" just as if a finger had been pressed on the bleeding point." When all else failed, Blasco (*Plus-Ultra,* March, 1919, 2, No. 9, p. 121) has succeeded in arresting hemorrhage with emetin, using 0.04 gm. in 1 mil of vehicle subcutaneously. He warns against giving it to pregnant women, and using old, inactive specimens of emetin.

Artificial Pneumothorax.—The greater our experience with this method of treatment, the more definitely are we able to determine the type of case in which it is applicable, the technic is more intelligently improved, and the dangers attending the procedure are better known, and may be more easily avoided.

The technic of the process has been reviewed by Morelli (*Rev. Méd. del Uruguay,* April, 1919, 22, No. 4, p. 293), and a simplification of the method as applied to patients with pleural effusions has been described by Challamel (*Bull. de la Soc. Med. des Hop.,* January 10, 1919, 43, No. 1, p. 12). The employment of atmospheric air instead of nitrogen has made the operation very much simpler (Morris, *Amer. Rev. Tuberc.,* October, 1918, 2, No. 8, p. 485), and experiments by Henius (*Deut. med. Woch.,* January 9, 1919, 45, No. 2, p. 36) indicate that air is not absorbed any more rapidly than nitrogen.

The dangers attending the injection are not to be ignored, and Stivelman (*N. Y. Med. Jour.,* February 1, 1919, 109, No. 5, p. 187) believes that nearly all cases of sudden collapse during the operation are due to pleural shock; air embolism, puncture of the heart, cocain poisoning and spontaneous pneumothorax being rarely encountered. Pleural effusion secondary to artificial pneumothorax is quite a common finding, due to compression of the vessels at the hilum, in the opinion of Breccia (*Rev. Critica di Clin. Med.,* May 3, 1919, 20, No. 18, p. 205, commenced in No. 16, p. 181). Rapid absorption of gas after injection, Varesco (*Rev. Critica di Clin. Med.,* May 24,

1919, 20, No. 1, p. 241) has noted, is frequently the first objective warning that pleurisy is present.

The opinions of various observers as to the value of this method of treatment are exceedingly interesting. Some of them believe it should be used earlier, and not as a last resort, in adults and children, and in every case of advanced tuberculosis (Stolkind, *Brit. Jour. Child. Dis.,* January–March, 1919, Nos. 181–183, p. 18) and in tuberculous pneumonia (Gammons, *Amer. Rev. Tuberc.,* October, 1918, 2, No. 8). Favorable reports have been published by Peters (*N. Y. Med. Jour.,* March 29, 1919, 109, No. 13, p. 535); Pearson (*Lancet,* July 26, 1919, 2, No. 5004, p. 148); Gutierrez-Gamero and Cerdeiras (*Rev. Med. Cubana,* September 13, 1919, 66, No. 3431, p. 764); Parfit and Crombie (*Amer. Rev. Tuberc.,* September, 1919, 3, No. 7, p. 385); and Cicconardi (*Rif. Med.,* February 22, 1919, 35, No. 8, p. 150). The immediate results were excellent, but the ultimate outcome was unsatisfactory in the fifteen cases in which Vos (*Nederl. Tijd. v. Gen.,* September 13, 1919, 2, No. 11, p. 713) employed this measure.

DISEASES OF THE LUNGS AND BRONCHI

Gangrene of the lung, in a case studied by Nolf (*Bull. de l'Acad. de Med.,* December 31, 1918, 80, No. 52, p. 657) was apparently due to the spirillum causing the foetid bronchitis which was present. In the treatment of gangrene of the lung de Almeida (*Brazil Med.,* December 14, 1918, 32, No. 50, p. 393) has seen good results following rib resection or drainage alone in pneumonia and pleuritic cases; and artificial pneumothorax has been employed successfully by Tobiesen (*Ugesk. f. Laeger,* October 3, 1918, 80, No. 40, p. 1577), Weill (*Bull. de l'Acad. de Med.,* October 29, 1918, 80, No. 43) and De Verbizier and Loiseleur (*Bull. de la Soc. Med. des Hop.,* December 6, 1918, 42, No. 34, p. 1139). Artificial pneumothorax has also been employed by Goldberg and Biesenthal (*Amer. Rev. Tuberc.,* May, 1919, 3, No. 3, p. 169) in acute *lung abscess,* with results which they believe are better than can be obtained by the usual medical and surgical methods. Seventy-five per cent. of the cases they have collected, treated by this method, have recovered. The etiology, symptomatology, diagnosis and treatment of this condition, as noted in the Mayo Clinic, have been reported by Hedblom (*Minn. Med.,* Septem-

ber, 1919, 2, No. 9, p. 337; and *Med. Rec.,* September 13, 1919, 96, No. 11, p. 441), the treatment employed being operation and drainage.

The chronic, inflammatory non-tuberculous disease of the lung is receiving more and more attention, as shown by the articles contributed by Lorrain and his co-workers (*Revue de Med.,* March–April, 1919, 36, No. 2, p. 173), Wilson (*War Medicine,* November, 1918, 2, No. 4, p. 556), Garrahan (*Arch. Lat.-Amer. de Pediatria,* May–June, 1918, 12, No. 3), and Ernst (*Jour. Med. Res.,* November, 1918, 39, No. 2, p. 143). A rather unusual finding has been reported by Sanchez (*Cron. Med.,* April, 1919, 36, No. 670, p. 138), who encountered a case in which pulmonary amœbiasis was responsible for hæmoptysis, the condition of the patient improving under emetin by the vein. The pathological and clinical manifestations following the inhalation of dust have been reported by Landis (*Jour. Indust. Hyg.,* July, 1919, 1, No. 3, p. 117), who comments on the difficulties attending the differentiation between pneumoconiosis and pulmonary tuberculosis.

The importance of a carefully taken history in the diagnosis of bronchiectasis is emphasized by Stivelman (*Amer. Jour. Med. Sc.,* October, 1919, 158, No. 4, p. 416) in his article on the differentiation of this condition from tuberculosis. The value of artificial pneumothorax in the treatment of dilatation of the bronchi is illustrated by the case reported by Weil (*Bull. de la Soc. Med. des Hop.,* July 4, 1919, 43, No. 23, p. 656).

The effect of *war gasses* on the lungs and bronchi is still of considerable interest as one constantly meets with these cases in civil practice, and it is important that one be familiar with the after-effects of various forms of gas if one is to be able to recognize the condition and treat it properly. The sequels of gassing in war have been reported by Achard (*Bull. de l'Acad. de Med.,* February 4, 1919, 81, No. 5) from his experience in 3525 cases, and by Winternitz (*Jour. Amer. Med. Assoc.,* August 30, 1919, 73, No. 9, p. 689).

Diaphragmatic hernia is a condition which is being more frequently reported since the Röntgen-rays have been more generally employed in the examination of the chest. The symptomatology, diagnosis and treatment of this condition, whether congenital or traumatic, have been described by Cade and Montaz (*Annales de*

Méd., September, 1919, 6, No. 4, p. 245), Warren (*Lancet,* June 21, 1919, 1, No. 25, p. 1069) and Ware (*Jour. Amer. Med.* Assoc., July 26, 1919, 73, No. 4, p. 267).

Foreign bodies in the bronchi is another condition which has become much better understood since the application of Röntgen-rays to the diagnosis of conditions in the chest. No one has added so much to our knowledge of the recognition and treatment of this condition as Chevalier Jackson, so that his recent contributions on this subject are of special significance. He discusses the pathology (*Surg., Gyn. and Obst.,* March, 1919, 27, No. 3, p. 201); a new diagnostic sign, the " asthmatoid wheeze " (*Amer. Jour. Med. Sc.,* November, 1918, 156, No. 5, p. 625); and the conditions resulting from the aspiration of peanut kernels, " arachidic bronchitis " (*Jour. Amer. Med. Assoc.,* August 30, 1919, 73, No. 9, p. 672); his deductions being based on large series of cases. The aspiration of food particles has also been described by van Wely (*Nederl. Tijd. v. Gen.,* June 14, 1919, 1, No. 24, p. 2119), and Craglietto (*Riv. di Clin. Ped.,* September, 1919, 17, No. 9, p. 477), and other phases of this subject are considered by Pringle (*Dublin Jour. Med. Sc.,* August–September, 1919, Third Series, Nos. 572–573) and Lemarchand (*Lancet,* October 11, 1919, 2, No. 5015, p. 646).

DISEASE OF PLEURA

A sign which may occasionally prove useful in distinguishing between malignant disease in the chest and pleural effusion, has been described by Novaro (*Rev. de la Asoc. Med. Argent.,* April–May, 1919, 30, Nos. 173–174, p. 300). He states that Pitres has recently called attention to the displacement of the sternum, toward the affected side, in pleural effusion, while in malignant disease this displacement of the sternum is away from the affected side. The diagnosis of pleural effusion is not, as a rule, attended with any great difficulty, but occasionally cases occur in which it is necessary to employ every method possible. In the presence of pleural effusion and pachypleuritis with adhesion, Menard (*Bull. de la Soc. Med. des Hop.,* October 25, 1918, 42, No. 32) has noted that the note on percussion is not modified by deep inspiration, and he states that if during forcible inspiration the note becomes modified these two conditions can be excluded. The presence of dulness in, or just below,

the axilla has been found by Mouriquand (*Presse Méd.*, March 24, 1919, 27, No. 17, p. 149) to be valuable evidence in favor of effusion in contradistinction to consolidation of the lower lobe.

The treatment of pleural effusions by the injection of air as the fluid is withdrawn has been employed for some time (Binda, *Gaz. d. Osped. e delle Clin.*, July 10, 1919, 40, No. 55, p. 554). Weil (*Bull. de l'Acad. de Med.*, June 24, 1919, 81, No. 25, p. 846) has recently reported fifty cases treated in this way, and Cetrángolo (*Semana Med.*, February 13, 1919, 26, No. 7, p. 161) also applies this treatment in plastic pleurisy. The routine treatment which Panto (*Gaz. degli Osp. e delle Clin.*, August 4, 1918, 39, No. 62, p. 604) applied in pleural effusion consists in repeated aspiration of 80 to 100 c.c. on alternate days at different points; giving digitalis, sodium salicylate and theobromin; painting the chest with iodin; a light milk and egg diet; and during convalescence the hypodermic injection of an iodin and iodide solution (Durante's formula). Hexamethylenamin by the vein has been employed by Loeper and Grosdidier (*Progr. Méd.*, December 21, 1918, 33, No. 51, p. 427) in thirty cases of pleural effusion with recovery in from seven to twenty-five days.

ASTHMA

The etiology of this disease is still a problem which receives considerable attention and which is not settled in spite of the fact that so much information has been obtained in regard to its relation to anaphylaxis. The disease is viewed by Sluder (*Jour. Amer. Med. Assoc.*, August 23, 1919, 73, No. 8, p. 589) as a nasal reflex, and Rampini (*Rev. Med. del Uruguay*, May, 1919, 21, No. 5, p. 389) calls attention to the various toxic, infectious and reflex causes of this disease, regarding tuberculosis as one of the most common. A series of four hundred cases of asthma has been recently studied by Walker (*Can. Med. Assoc. Jour.*, February, 1919, 9, No. 2, p. 97), and of these one hundred and ninety-one (48 per cent.) gave a positive skin test, showing that they were sensitive to some protein. Acting on the theory that it is a manifestation of anaphylaxis, peptone has been employed in the treatment by Joltrain (*Bull. de la Soc. Med. des Hop.*, June 6, 1919, 43, No. 19, p. 556) and Sabatini (*Policlinico*, June 8, 1919, 26, No. 23, p. 709, commenced in No. 22,

p. 673), with the object of desensitizing the individual to the protein causing the asthma by means of this foreign protein. While the use of peptone would simplify the desensitization, it is too soon to say whether it will prove as efficient as the use of specific proteins. This entire problem of specific and non-specific desensitization has been recently reviewed by Kraus (*Rev. del Inst. Bact.,* March, 1919, 2, No. 1, p. 1). The treatment of bronchial asthma with vaccines made up of the bacteria to which they are sensitive has been employed by Walker (*Arch. Int. Med.,* February 15, 1919, 23, No. 2, p. 220) in twenty-eight cases with relief in 75 per cent. of the cases and improvement in 21 per cent.

The relation of the endocrine glands to hay-fever and asthma has been studied by Selfridge (*Calif. State Jour. of Med.,* May, 1919, 17, No. 5, p. 139) in twenty-two cases of asthma, in six of which thyroid predominated, in fifteen hypopituitary and in one probably status lymphaticus. The suprarenal-pituitary treatment of asthma, in the experience of Massalongo (*Riv. Crit. di Clin. Med.,* October 5, 1918, 19, No. 40, p. 469), has been followed by marvelous results impossible to realize with either alone. The dose he found most effective was: Epinephrin, 0.0008 gm.; pituitary extract, 0.0004 gm., in 1 c.c. of solution, injected subcutaneously. The value of this treatment in arresting the attacks is also commented upon by Sabatini (*Policlinico,* June 8, 1919, 26, No. 23, p. 709, commenced in No. 22, p. 673), who considers even prolonged administration of these two extracts as harmless, one of his patients of sixty-five years having taken daily injections for over six years without any effect upon his blood-pressure. In children Spolverini (*Pediatria,* October, 1918, 26, No. 10, p. 569) gives epinephrin by the mouth with marked benefit, with the addition of calcium bromide, 1.5 gm., during the attacks.

The use of benzyl benzoate for the relief of this condition is advocated by Macht (*Jour. Amer. Med. Assoc.,* August 23, 1919, 73, No. 8, p. 599, and *South. Med. Jour.,* July, 1919, 12, p. 367).

HEART

The cardiovascular examinations of recruits have provided a great deal of valuable material which is of special interest from the standpoint of frequency of valvular and other cardiac defects. One

of the most striking features in the table prepared by Cass (*Jour. Amer. Med. Assoc.,* January 25, 1919, 72, No. 4, p. 248), showing the number of cardiac defects found and the disposition of the cases, is the large number accepted with various valvular lesions (chiefly mitral insufficiency). Among over seventy-one thousand men he reports sixty-four cases of aortic insufficiency alone, which is quite a contrast to the ninety-four cases of simple aortic insufficiency that Wells (*Brit. Med. Jour.,* April 26, and May 3, 1919, 2, Nos. 3043–3044, pp. 510 and 544) found among ten thousand recruits.

The interpretation of heart murmurs is discussed in a paper by Esmein (*Paris Méd.,* July 5, 1919, 9, No. 27, p. 9) who comments on the different significance attached to murmurs by British and French examiners. He does not agree with the British view of accepting all diastolic murmurs as organic, and all systolic murmurs as having no significance. The response to exercise is believed by Rothschild (*Jour. Amer. Med. Assoc.,* February 1, 1919, 72, No. 5, p. 327) to be a valuable method of diagnosing mitral disease among the cases with systolic apical murmurs. He accepts Lewis's ruling in regard to these cases that they should be rejected on the grounds of cardiac hypertrophy or poor exercise response, or accepted for limited service because of a definite attack of rheumatic fever, and not on account of the systolic murmer *per se,* which is disregarded. In reference to mitral stenosis, the same observer (*Jour. Amer. Med. Assoc.,* March 1, 1919, 72, No. 9, p. 652) emphasizes the importance of a careful examination in the early cases of this not uncommon disease, the thrill he considers of little value, it must be differentiated from the overacting heart, oculopupillary pressure proving of great value in this regard, and in the cases in which there are slow acting hearts he has found Morrison's amyl nitrite test of value. This test has also been found of value by Benjamin and Brooks (*Jour. Amer. Med. Assoc.,* March 8, 1919, 72, No. 10, p. 707) in the diagnosis of presystolic murmurs.

It has long been recognized that the auscultation and percussion findings in valvular disease of the heart cannot be accepted as a basis upon which to estimate the working capacity of the heart, some cases with marked valvular lesions being capable of extremely strenuous exercise and severe fatigue. Numerous tests have been devised or suggested for determining this functional capacity of the heart,

which Triviño (*Med. Iberia,* July 26, 1919, 8, No. 90, p. 53) has applied to twenty patients, the course of the cases indicating that Lian's method, Mendelssohn's and Mackenzie's, with Vaquez' differential pressure, the difference between the maximal and minimal tension, and the oculocardiac reflex gave one a good oversight of the conditions in the heart as a whole. He found the Abrahams, Hertz and Gräupner tests unreliable.

One of the most interesting conditions which attracted attention through the examination of large numbers of recruits and soldiers has been the condition variously known as *neurocirculatory asthenia,* irritable heart of soldiers, soldiers' heart, effort syndrome, disordered action of the heart (D.A.H.), etc., the characteristic symptoms of which are dyspnœa, palpitation, precordial pain, weakness and profuse sweating. While numerous cardiac defects are not infrequent among these cases (Maynard, *Med. Jour. of South Africa,* March, 1919, 14, No. 8, p. 395), the cardiac phenomena are usually looked upon as having only an accidental relationship to this condition (King, *Arch. Int. Med.,* July, 1919, 24, No. 1, p. 89), as there is no pathological change in the heart, the fundamental process being apparently due to hyperexcitation of the sympathetic nervous system (Neuhof, *Arch. Int. Med.,* July, 1919, 24, No. 1, p. 51).

The etiology of this condition is obscure, being apparently not dependent on racial predisposition, smoking, specific infecting organism, or acidosis. Tuberculosis has been suspected as a possible cause of this condition, but King (*Arch. Int. Med.,* August 15, 1919, 24, No. 2, p. 238) believes that when this relationship is found it is purely accidental, and MacIntyre (*Bull. Can. Army Med. Corps,* May 1, 1919, 1, No. 8, p. 112) obtained a positive subcutaneous tuberculin test in only thirty-two (10.6 per cent.) of the three hundred cases in which he applied it. More significant is the possibility of a relationship between the thyroid and neurocirculatory asthenia, as in Carrol's (*Amer. Jour. Med. Sc.,* July, 1919, 158, No. 568, p. 35) opinion there is an analogy between certain types of hyperthyroidism and this condition. Hyperthyroidism when present in these cases is looked upon by Smith and Bovaird (*Amer. Jour. Med. Sc.,* December, 1918, 156, No. 6, p. 872), and by Addis and Kerr (*Arch. Int. Med.,* March 15, 1919, 23, No. 3, p. 316) as nothing more than a contributory factor. In this connection the results of epinephrin tests

as employed by Goetsch in his study of thyroid disease, are of considerable interest. Among twenty-seven controls a typical reaction was never obtained by Peabody, Clough, Sturgis, Wearn and Tompkins (*Jour. Amer. Med. Assoc.*, December 7, 1918, 71, No. 23, p. 1912), and only one gave a slightly suggestive reaction, while in sixty-five patients with irritable heart the test was positive in 60 per cent., doubtful or suggestive in 10 per cent. and negative in 30 per cent.

The mechanism of *paroxysmal tachycardia* has been studied by Galli (*Arch. des Mal. du Cœur,* July, 1919, 12, No. 7, p. 289) by means of tracings of the heart action, and his findings seem to confirm the assumption that the cause may be in some cases merely a functional nervous disturbance traceable to endocrine influences. The reaction to work in the cases studied by Barringer (*Arch. Int. Med.,* December 15, 1918, 22, No. 6, p. 805) makes it evident that whatever the underlying cause in this group of men, the heart's reserve power in each one was decreased. An attack of paroxysmal tachycardia can be arrested by impending the entrance of air, compelling respiratory effort, according to Fiessinger (*Bull. de l'Acad. de Med.,* April 15, 1919, 81, No. 15, p. 476), he says the same effect may be obtained by vomiting, but the effort of breathing deep is simpler and easier, and its effect is amazing.

Arrhythmia is always a sign of pathologic reduction of the functional capacity of the heart, according to Martinez (*Prensa Med. Argent.,* January 10, 1919, 5, No. 22, p. 217), who insists that the nervous system alone is unable to modify the rhythm, if the heart is absolutely histologically and functionally sound. The clinical and post-mortem study of thirty cases of constantly irregular pulse has been made by Yamada (*Mitt. aus der med. Fak. du Univ. zu Tokyo,* July 13, 1918, 20, No. 1, p. 85), in which the majority showed pathologic changes in the sinoauricular node. Six cases of total arrhythmia without valvular lesion have been reported by Gallavardin (*Paris Méd.,* October 19, 1918, 8, No. 42, p. 301), in some of which the arrhythmia seemed to cause no disturbance, but he considered the outlook much graver than with simple extrasystolic arrhythmia. Not much importance can be ascribed to *extrasystoles,* according to Galli (*Policlinico,* December 22, 1918, 25, No. 51, p. 1256), as they may be encountered in both the well and the sick. He warns against calling the subject's attention to them. The frequency with which

auricular flutter is encountered in elderly people is noted by Silber-
berg (*Med. Jour. Australia,* May 31, 1919, 1, No. 22, p. 435), and
the frequency of this condition is also emphasized by Meakins (*Can.
Med. Assoc. Jour.,* July, 1919, 9, No. 7, p. 606), who calls attention
to the importance of persistent treatment with digitalis until the
normal rhythm is re-established or symptoms of digitalis poisoning
develop.   The prognosis in *auricular fibrillation* is extremely grave,
as a rule, in the opinion of Calandré (*Prog. de la Clin.,* July, 1919,
7, No. 79, p. 5), although he encountered a case in a morphin addict
which cleared up after a course of treatment for his drug habit.   The
prognosis in heart disease in those with pulsus alternans, auricular
fibrillation and normal rhythm has been studied by White (*Amer.
Jour. Med. Sc.,* January, 1919, 157, No. 1, p. 5), a large number
being followed for two or three years.   He has found an especially
high mortality among those with higher grades of alternation, and
with auricular fibrillation complicated by aberrant ventricular com-
plexes, while uncomplicated auricular fibrillation had a surprisingly
low mortality percentage.

The oculocardiac reflex has been extensively studied by Binet
(*Presse Méd.,* August 21, 1919, 27, No. 46, p. 462), from which he
draws numerous practical applications.   The disappearance of in-
organic and exaggeration of organic murmurs may be produced by
the application of this compression of the eyeball.   It may abort an
attack of paroxysmal tachycardia, and it has an inhibiting effect upon
asthma and hiccup, the latter being especially distinct.

Treatment.—In chronic insufficiency of the heart Rubow (*Hos-
pitalst.,* August 20, 1919, 62, No. 34, p. 969) has obtained benefit
from the *Karell treatment;* he lays great stress on the importance of
the calory content, and the salt and water content of the food as
affecting the course of the heart disease.   Prompt and efficient diu-
resis, loss of weight, disappearance of œdema and marvellous sub-
jective improvement can be obtained by following a modified Karell
cure outlined by Potter (*Calif. State Jour. of Med.,* January, 1919,
17, No. 1, p. 11).

Digitalis in the rapid regular rheumatic heart is just as effectual
as in the cases of auricular fibrillation, according to Sutherland
(*Quart. Jour. Med.,* April, 1919, 12, No. 47, p. 183).   In selected

cases Kay (*Calif. State Jour. of Med.,* September, 1919, 17, No. 9, p. 329) has found the rapid administration of digitalis followed by striking improvement in favorable cases, and serious toxic effects were not observed. In cardiorenal cases Layton (*Wis. Med. Jour.,* April, 1919, 17, No. 11, p. 435) prefers the intramuscular and intravenous routes of administration of digitalis, on account of the uncertain absorption from the gastro-intestinal tract in these cases. If the heart needs digitalis, he believes any existing hypertension may be disregarded. Powdered digitalis leaf made freshly into pills is as satisfactory, in the opinion of Christian (*Amer. Jour. Med. Sc.,* May, 1919, 157, No. 566, p. 593) as either the tincture or the infusion, and if the leaf is good it is just as effective as digipuratum or digifolin, and far less expensive. Marked variations in the efficiency of different preparations of standardized tinctures of digitalis were noted by Wedd (*Bull. Johns Hopkins Hosp.,* May, 1919, 30, No. 339, p. 131).

Opium (morphin) in acute pulmonary œdema, and in heart disease is advocated my Laubry and Esmein (*Paris Méd.,* October 19, 1918, 8, No. 42, p. 296). Even in albuminuria, with high blood-pressure and scanty urine, they have seen benefit from its use, although they believe greater caution is required in employing it in patients with permanent high tension.

INCREASED BLOOD-PRESSURE

The *prognosis* in permanently high blood-pressure (above 180 mm.) is considered by Topp (*Hospilst.,* June 4, 1919, 62, No. 23, p. 705) as grave. Among one hundred and fifty-seven cases seen by him between 1913 and 1916, recent reports show that 83.5 per cent. have died, the survivors being all persons who were able to reduce physical exertion to the minimum.

The treatment of hypertension with natural carbonated baths is advocated by de la Carriere (*Presse Méd.,* June 26, 1919, 27, No. 36, p. 349), and the treatment of this condition in women has been outlined by Riesman (*Jour. Amer. Med. Assoc.,* August 2, 1919, 73, No. 5, p. 330), with special reference to the regulation of diet and mode of living, baths, electricity and such medication as is indicated in the individual case.

DISEASES OF THE KIDNEY

The proper appreciation of the indications of albumin or formed elements in the urine is essential for the purpose of forming a correct prognosis or instituting adequate treatment. An interesting study of the various types of non-nephritic albuminuria has been made by Romanelli (*Policlinico,* February, 1919, 26, Med. Sect., No. 2, p. 62), with special reference to life insurance.

The response of an " accommodation test," consisting of one litre of weak tea in a fasting patient, Scheel (*Ugesk. for Laeger,* August 28, 1919, 81, No. 35, p. 1379) found to be instructive in many cases, aiding in the diagnosis and being a useful guide in the management of the case. In acute nephritis, Vander Veer and Saunders (*Jour. Amer. Med. Assoc.,* May 31, 1919, 72, No. 22, p. 1586) found the phenolsulphonephthalein test of distinct value, the two-hour renal test being less instructive. The combination of measures for estimating potential renal functioning which Flegel, Iturbe and Gonzales (*Gac. Med. de Caracas,* November 15, 1918, 25, No. 21, p. 223) found to give almost reliable information when nephrectomy is contemplated are: the dilution test, the phlorizin test, the chromoureteroscopy, the phenolsulphonephthalein test, the Ambard formula, and the application of the laws regulating the urea and the chlorids in the segregated urine. Even the Ambard formula does not supply the information which will determine the possibility of employing a general anæsthetic or performing a major operation without special risk, according to Razetti (*Gac. Med. de Caracas,* October 15, 1918, 25, No. 19, p. 197). The variability of the findings of the Ambard constant, leads Ameuille and Sourdel (*Bull. de la Soc. Med. des Hop.,* May 9, 1919, 43, No. 16, p. 417) to warn that several repetitions are necessary to get an accurate estimate of the true conditions, and Velasquez (*An. de la Fak. de Med.,* Lima, September–October, 1918, 2, No. 5, p. 110) says it cannot be used if the urine is less than 500 c.c. per diem, and cannot be relied upon unless the urea in the blood and in the urine and the ammonia in the urine are all determined.

In the cases of acute hemorrhagic or chronic nephritis terminating in recovery or improvement, Scheel (*Norsk. Mag. for Laeger.,* April, 1919, 80, No. 4, p. 363) found the blood urea never over 1.94 per thousand. In a group which terminated unfavorably in a few weeks

or months the urea content was over two per thousand, and with over four per thousand death always occurred within a few days. The upper normal limit of urea nitrogen in the blood is placed by Kast and Wardell (*Arch. Int. Med.,* November 15, 1918, 22, No. 5, p. 581) at 20 mg. per 100 c.c. In the diagnosis and prognosis of urologic cases, Goldstein (*Jour. Amer. Med. Assoc.,* December 14, 1918, 71, No. 24, p. 1957) considers the blood urea a valuable retention test, in cases with more than 1 gm. per litre the prognosis should be considered grave, and with less than 0.75 gm. as good. The significance of the findings in the study of blood chemistry, based on some fifteen thousand determinations in various diseases and conditions, is described by Gettler and St. George (*Jour. Amer. Med. Assoc.,* December 21, 1918, 71, No. 25, p. 2033). The creatinin of the blood is believed by Myers and Killian (*Amer. Jour. Med. Sc.,* May, 1919, 157, No. 566, p. 674) to be a better prognostic indicator than either the blood urea or phenolsulphonephthalein tests.

The value of the salt free diet in certain forms of nephritis, Lemierre (*Paris Méd.,* July 12, 1919, 9, No. 28, p. 34) believes, has been one of the most surprising discoveries of recent years. He describes the Widal and Javal menu yielding 1500 calories, made up of bread, meat, potatoes and wine or coffee.

Among thirty-two cases of eclampsia, Roe (*Med. Iberia,* September 21, 1918, 4, No. 46, p. 297) had only two fatalities. He employed morphin in all of these cases, according to Rouvier's technic, and he believes that all would have been saved if this drug could have been given at the very first convulsions.

War Nephritis.—The frequency with which nephritis occurred among the armed forces in the war may be estimated from the fact that in two typical British general hospitals it represented about 5 per cent. of all medical casualties sent from the line, according to Fitz (*Military Surgeon,* July, 1919, 45, No. 1, p, 80, and *Jour. Amer. Med. Assoc.,* July 19, 1919, 73, No. 3, p. 168). He believes it has well-marked clinical characteristics, the four most prominent being: acuteness of onset, dyspnœa, rapidly developing and disappearing œdema and sudden and frequent uremic manifestations.

The etiology of the disease is unknown, but fever at the onset of the disease suggests the possibility of an infectious origin, an impression which Fitz (*v.s.*) believes is confirmed by the tendency to relapse.

The frequency of fever just preceding or during the beginning of the disease is mentioned by Day (*Lancet,* November 16, 1918, 2, No. 20, p. 660), although he thinks that the seasonal incidence of the disease points to cold and exposure as predisposing agents.

RENAL DIABETES

Sugar in the urine has always been looked upon as the cardinal sign of diabetes mellitus, but with the help of the blood studies a certain proportion of the cases which show the presence of sugar in the urine have been found to be not diabetes mellitus, the so-called *renal diabetes.* For the recognition of these cases Williams and Humphreys (*Arch. Int. Med.,* May 15, 1919, 23, No. 5, p. 559) recommend the glucose tolerance and utilization test, proposed by Hamman and Hirschmann and later modified by Janney.

Glycæmia.—The relation of glycæmia to glycosuria in diabetes mellitus and renal diabetes is an extremely important subject, upon which opinions seems to differ in certain regards. While believing that an alimentary influencing of renal diabetes is nearly always unmistakable, Lépine (*Rev. de Méd.,* November–December, 1916, 35, Nos. 11–12, p. 663. Pub'd December, 1918) declares that the generally accepted idea that the sugar content of the blood is abnormally high in diabetes is erroneous, many having less than two per thousand which he considers within normal limits. The maximum normal digestion blood sugar level is placed at 0.15 per cent. by Williams and Humphreys (*Arch. Int. Med.,* May 15, 1919, 23, No. 5, p. 546), although they believe diabetes patients are safer when this level is not higher than 0.13 per cent. In the healthy fasting individual the sugar content has been found by Baudouin (*Paris Méd.,* May 3, 1919, 9, No. 18, p. 346) to keep tenaciously around 1 gm. per litre, believing that over 1.3 or below 0.9 gm. indicates pathological conditions.

DIABETES MELLITUS

The pancreas should be suspected and investigated in every case of diabetes, in the opinion of Labbé (*Annales de Med.,* August, 1919, 6, No. 3, p. 204), and if found at fault pancreatic opotherapy instituted, with the object of supplying the lacking pancreatic digestive juice and also to stimulate internal secretions. The failure of the internal secretion, Ervin (*Jour. Lab. and Clin. Med.,* Septem-

ber, 1919, 4, No. 12, p. 711) believes is the cause of the state of pancreatic diabetes.

Four years' experience with the *Allen treatment* of diabetes has convinced Geyelin (*Jour. Amer. Med. Assoc.,* October 18, 1919, 73, No. 16, p. 1202) that, while we have no cure for this disease, we have a greatly improved method of treatment, particularly as regards prolongation of life and the avoidance of surgical complications.   He calls attention to the insidious harmful effects of a long-continued diet overbalanced in fat (180 gm. and over), from their depressing effect on tolerance as well as from their immediate effects in the production of acidosis and glycosuria.   A high protein diet, Mosenthal and Harrop (*Arch. Int. Med.,* December 15, 1918, 22, No. 6, p. 750) have found, is the most advisable low calory, carbohydrate-free diet by which to conserve the body tissues and furnish a maintenance ration for the diabetic.   Systematic and persevering treatment for one, two or three months enabled Petrén (*Nord. Med. Ark.,* November 30, 1918, 51, Int. Med. Sect., No. 2, p. 107) to increase the daily carbohydrate tolerance of many of his patients 33, 50, 91 or 118 gms., and even 128 gms. with longer treatment.   Employing the Allen treatment, Fitz and Bock (*Quart. Jour. Med.,* July, 1919, 12, No. 48, p. 307) were able to secure a tolerance of 150 gm. of carbohydrate without the development of glycosuria in the patient they studied.   The charts prepared by Donk (*Jour. Amer. Med. Assoc.,* July 5, 1919, 73, No. 1, p. 25) will be found exceedingly convenient for physicians desiring to control the diet of their patients in an accurate, scientific manner.

The prevention and treatment of diabetic coma are discussed at length by Cammidge (*Lancet,* January 11, 1919, 1, No. 2, p. 60), who lays stress on the importance of massive alkaline injections: and the methods employed at the Rockefeller Institute to detect as early as possible the development of acidosis and prevent its progress, are described by Stillman (*Arch. Int. Med.,* October 15, 1919, 24, No. 4, p. 445).

DISEASES OF THE STOMACH

The relationship between *achylia gastrica* and *local* and *systematic infection* has been studied by Beck and McLean (*South. Med. Jour.,* October, 1919, 12, No. 10, p. 594), who found that most of the local

sources of infection were about the head, chiefly as some form of oral sepsis; chronic cholecystitis, appendicitis, arthritis, pyelitic and rectal abscesses forming the remainder of the focal infections. The rebellious dyspepsias have usually some obscure organic basis, in the opinion of Nordman (*Paris Méd.,* November 30, 1918, 8, No. 48, p. 433), who lays special stress on the importance of tuberculosis in the etiology of this group of cases.

From a study of the gastric contents by the fractional method, Crohn (*Amer. Jour. Med. Sc.,* November, 1918, 156, No. 5, p. 656) believes that single doses of dilute hydrochloric acid are merely temporary in their effect, and advocates the use of small doses repeated every fifteen to thirty minutes, whenever it is practicable to do so. The study of the fasting stomach is regarded by Pron (*Paris Méd.,* July 26, 1919, 9, No. 30, p. 70), and Labbé (*Bull. de la Soc. Med. des Hop.,* May 16, 1919, 43, No. 17, p. 437) as providing much more valuable information than the gastric contents after a test meal.

AMŒBIC ABSCESS OF THE LIVER

The treatment of amœbic abscess of the liver with emetin has made this condition a much less serious one than formerly. Among fifty cases Marotta (*Rev. Sud-Amer. de Endocrin.,* January 15, 1919, 2, No. 13, p. 3) found the subcutaneous injection of this drug was the only measure necessary in nearly all the patients. Operative treatment may be necessary as a supplement to the emetin, as Bello and Sanchez (*Observ. y Notas,* February, 1919, 1, No. 11, p. 217) and Pontano (*Policlinico,* June, 1919, 26, Med. Sect., No. 6, p. 236) point out, while Simoncelli (*Ibid.,* p. 222) believes the operation should be performed at once, being supplemented by emetin; Talbot (*Brit. Med. Jour.,* September 20, 1919, 2, No. 3064, p. 375) relying on aspiration of the abscess with a syringe and emetin hypodermically.

CHOLELITHIASIS

The stomach findings after different test meals in patients with gall-stones have been studied by Wessel (*Hospitalst.,* September 18, 1918, 61, No. 38, p. 1233) the most striking finding being the reduction or complete suspension of hydrochloric acid secretion in these cases. Hypercholesterolemia was not a constant finding in the cases of cholelithiasis studied by Galindez (*Anales del Inst. Modelo de*

Clin. Med., July–December, 1918, No. 2, p. 255), although the cholesterol content of the blood was found to be increased in all the gall-stone cases studied by Fedeli and Torri (*Rif. Med.,* December 21, 1918, 34, No. 51, p. 1010), the cholesterol content sinking to normal under the influence of the spa treatment he employed. The X-ray should be able to detect the presence of gall-stones in about 50 per cent. of the cases in which they exist, according to Pfahler (*Jour. Amer. Med. Assoc.,* December 14, 1918, 71, No. 24, p. 1951).

CHOLECYSTITIS

The studies of Brown (*Arch. Int. Med.,* February 15, 1919, 23, No. 2, p. 185) indicate that the streptococcus is the chief organism associated with this condition. The importance of cholecystitis in the production of gastric symptoms is emphasized by Vanderhoof (*Med. Rec.,* September 20, 1919, 96, No. 12, p. 487) and Churchman (*Jour. Amer. Med. Assoc.,* January 4, 1919, 72, No. 1, p. 17), and a new method for studying the gall-bladder contents by aspirating them through a duodenal tube, has been described by Lyon (*Jour. Amer. Med. Assoc.,* September 27, 1919, 73, No. 13, p. 980). The medical treatment of gall-bladder affections is described by Niles (*South. Med. Jour.,* January, 1919, 12, No. 1, p. 10), who details a number of prescriptions which he has found useful in meeting various conditions.

INTESTINAL PARASITES

In the treatment of uncinariasis Bircovitz (*China Med. Jour.,* January, 1919, 33, No. 1, p. 34) found oil of chenopodium 25 per cent. more efficient than thymol, being also safer and more easy of administration. Soluble capsules were found more efficient than soft gelatine capsules for the administration of oil of chenopodium by Knowlton (*Jour. Amer. Med. Assoc.,* March 8, 1919, 72, No. 10, p. 701), and Kantor (*Jour. Amer. Med. Assoc.,* October 18, 1919, 73. No. 16, p. 1181) has described a method for the administration of this drug by means of the duodenal tube.

Amœbiasis.—In amœbic dysentery Bello (*Observ. y Notas,* January, 1919, 1, No. 10, p. 190) obtained excellent results from the administration of emetin by the vein, which he found very well tolerated. A paste made of charcoal, bismuth and ipecac has been

employed by Ravaut and Charpin (*Paris Méd.*, August 16, 1919, 9, No. 33, p. 125), alternating with capsules containing arsphenamin. From his study of ipecac and its alkaloids, Simon (*Jour. Amer. Med. Assoc.*, December 21, 1918, 71, No. 25, p. 2042) found the crude ipecac root is not toxic, and when employed under proper conditions, not only destroys the vegetative enameba but the encysted forms as well, and thereby prevents recurrences or relapses of the infection.

TYPHOID FEVER

The reduction of the death rate from typhoid fever in the large cities in this country during the year 1918 was especially significant in view of the large number of men collected in the various training camps, under conditions which heretofore have nearly always given rise to epidemics of this disease with a corresponding increase in the general death rate. While most of the cities show a very low death rate (*Jour. Amer. Med. Assoc.*, April 5, 1919, 72, No. 14, p. 997), Chicago leading with a rate of 1.4 per 100,000 population, it is surprising to find that there are five cities with a rate over 20 (New Orleans, 20.1; Birmingham, Ala., 31.9; Nashville, Tenn., 32.7; San Antonio, Texas, 54.3; and Richmond, Va., 65.3). This holding down of the death rate under war conditions is probably the result of typhoid vaccination, together with improvement in camp hygiene. Valuable as the anti-typhoid inoculation has been in the prevention of this disease, it must not be used in any way as an excuse for relaxing vigilance in the regular sanitary measures (*Jour. Amer. Med. Assoc.*, May 3, 1919, 72, No. 18, p. 1298).

The interest in vaccination seems to be largely centred in the use of lipovaccines which have the advantage of having only one-fifth of the toxin of typhoid bacilli content of the normal vaccine and may, therefore, be employed in larger doses at one time without serious reactions, according to Abe and his co-workers (*Bull. Naval Med. Assoc. of Japan,* February, 1919, No. 22, p. 4). Lipovaccines are the ideal vaccine, in the opinion of Mazza (*Prensa Med. Argent.,* November 10, 1918, 5, No. 16, p. 157) on account of their slow absorption without reactions, and their indefinite keeping properties without change. A method for the preparation of prophylactic and autogenous lipovaccines has been described by Rosenow and Osterberg (*Jour. Amer. Med. Assoc.*, July 12, 1919, 73, No. 2, p. 87),

which they believe gives a perfectly even, homogeneous suspension with various species of bacteria.

The problem of the typhoid carrier is extremely important, as the number of these individuals is probably a large one. The incidence seems to be relatively higher in institutions than in the general population, an exceptionally high rate being reported by Krumwiede and Somers (*Jour. Amer. Med. Assoc.,* December 28, 1918, 71, No. 26, p. 2131). Urinary carriers are really kidney carriers and can be cured by nephrectomy, according to Nichols, Simmons and Stimmel (*Jour. Amer. Med. Assoc.,* August 30, 1919, 73, No. 9, p. 680), they also divide the intestinal carriers into two groups: one in which the gall-bladder alone is infected, which can easily be cured by cholecystectomy, and one in which the gall-bladder and bile passages are both infected in which cholecystectomy does not cure the condition. While surgical treatment of typhoid carriers is not perfect, they believe it is the best available.

The use of antiserum in one hundred and twenty-seven cases of typhoid fever, Rodet and Bonnamour (*Bull. de l'Acad. de Med.,* June 3, 1919, 81, No. 22, p. 759) found, resulted in a low death rate, and even in the fatal cases great benefit was apparent. From his observation on twenty odd cases, Barreiro (*Bol. de la Asoc. Med. de Puerto Rico,* June, 1919, 13, No. 123, p. 38) is convinced of the value of epinephrin in the treatment of typhoid fever in the tropics.

PARATYPHOID INFECTIONS

The experience during the war in the treatment of this disease has shown, according to Gautier and Weissenbach (*Progrès Méd.,* August 2, 1919, 34, No. 31, p. 301), that subcutaneous injections of a specific vaccine seems to have materially hastened the cure and reduced the death rate from 7.78 per cent. to 3.4 per cent. (1119 cases).

TYPHUS FEVER

The diagnosis of typhus by means of the agglutination test with the Weil-Felix strain of proteus x 19, has been studied by a number of observers, who have found that the agglutination occurs almost constantly in this disease, in 1 : 50 to 1 : 800 dilutions (Montefusco, *Rif. Med.,* September 13, 1919, 35, No. 37, p. 782). While typhus serum is the only one which will produce this reaction, Ribeyro (*Cron.*

Med., March, 1919, 36, No. 669, p. 75) is not ready to accept this proteus organism as the cause of typhus fever, and Aldershoff (*Nederl. Tijd. v. Geneesk.,* January 25, 1919, 1, No. 4, p. 319) has reported an epidemic of typhus in which the same agglutination reaction took place with an old strain of paratyphoid A. In the application of the test, Kraus (*Rev. Méd. de Chile,* April, 1919, 47, No. 4, p. 131, and *Prensa Méd. Argent.,* April 20, 1919, 5, No. 32, p. 317) has employed an alcoholic preparation of the proteus, which he believes possesses certain advantages over the live culture, being more sensitive, and may be kept for two years.

The treatment of this disease according to Nolf's method of intravenous injections of peptone has been carried out by Prado Tagle (*Rev. Méd. de Chile,* August, 1919, 47, No. 8, p. 413) and by Opazo (*Ibid.,* p. 433), with unmistakable improvement in the general condition in every case.

TRENCH FEVER

The possibility of returning troops acting as foci of infection must be borne in mind; although every precaution known is being employed to avoid the danger from this source. Still our knowledge of the disease is not complete, and there is a possibility that long latent periods and late relapses may occur, when lice may spread the disease (Swift, *Jour. Amer. Med. Assoc.,* September 13, 1919, 73, No. 11, p. 807). In two of the six cases studied by Coles (*Lancet,* March 8, 1919, 2, No. 4984, p. 375) a few spirochæte-like bodies were found in the blood, although he has not ascertained whether they bear any actual causal relation to this disease.

MALARIA

The prevention of this disease may be attempted from two standpoints—the treatment of chronic carriers or the eradication of the mosquito and mosquito breeding places. The first method has been carried out in Mississippi with such a marked reduction in the frequency of the disease that Bass (*Southern Med. Jour.,* April, 1919, 12, No. 4, p. 190, and *Jour. Amer. Med. Assoc.,* April 26, 1919, 72, No. 17, p. 1218, and July 5, 1919, 73, No. 1, p. 21) believes it offers a practical method for malaria control.

The practical application of the elimination of mosquitoes involves

such numerous and varied measures to cope with the different local conditions that it is impossible to summarize the valuable reports of Royer and Emerson (*Amer. Jour. Pub. Health,* May, 1919, 9, No. 5) covering their work at Hog Island, those of Geiger, Purdy and Tarbett (*Jour. Amer. Med. Assoc.,* March 15 and 22, 1919, 72, Nos. 11 and 12, p. 774 and 844) in rice field districts in Louisiana and Arkansas, and Darling (*Annaes Paulistas de Med. e Cir.,* December 1918, 9, No. 12, p. 265) in the Malay States. The malaria control measures usually involve an expenditure of large amounts of money and the question may arise as to whether the cost would be justified from an economic standpoint. This question has been carefully studied by Gray (*Jour. Amer. Med. Assoc.,* May 24, 1919, 72, No. 21, p. 1533) in a district in California, from which he concludes that the savings from the measures employed show a considerable profit over the money expended.

A standard quinine formula for the treatment of malaria has been suggested by Mayne (*Jour. Amer. Med. Assoc.,* October 11, 1919, 73, No. 15, p. 1119) consisting of 40 gr. for 5 days, 20 gr. for 10 days, 10 gr. for 20 days, and 5 gr. for 40 days. In his comment on this plan of treatment Carter (*Ibid.*), while agreeing with the principle of the method, advises against the final adoption of any such plan until we know more about it both absolutely and as compared with other methods. A more complicated formula for the treatment of this disease has been outlined by Cardamatis (*Grèce Méd.,* January–June, 1918, 20, Nos. 1–12), who believes that the administration of quinine by mouth is as effectual as by injection. Intramuscular injections are believed by Nicotra (*Policlinico,* February 16, 1919, 26, No. 7, p. 202) to be too slowly absorbed, and he, therefore, urges intravenous injections from the very first, but Pezzi (*Policlinico,* June, 1919, 26, No. 6, Med. Sect., p. 239) states that the intravenous route should be reserved for the graver cases and for malignant tertian when first diagnosed.

EPIDEMIC CEREBROSPINAL MENINGITIS

The meningococcus carrier is undoubtedly responsible for many of the outbreaks of this disease. The proportion of carriers found among troops in routine examination was found to be 3.22 per cent. by Schorer (*Jour. Amer. Med. Assoc.,* March 1, 1919, 72, No. 9, p. 645),

2.1 per cent. by Stone (*Ohio State Med. Jour.,* August 1, 1919, 15, No. 8, p. 483), and 1 to 4 per cent. by Orbaan (*Nederl. Tijd. v. Gen.,* July 12, 1919, 2, No. 2, p. 101). Statistics collected by Hyge (*Ugesk. for Laeger,* September 19, 1918, 80, No. 38, p. 1514) vary between 2.1 per cent. and 19 per cent. That probably a large proportion of the carriers are only temporary or casual carriers has been pointed out by Schorer (*v.s.*), and by Embleton, Bryant and Steven (*Lancet,* October 18, 1919, 2, No. 5016, p. 679). That carriers may be detected and isolated, even in large bodies of men, has been demonstrated by Schorer (*v.s.*), and isolation is recommended by Maranon and Ruiz y Falco (*Siglo Med.,* December 7, 1918, 65, No. 3391, p. 933), who also state that preventive vaccination is promising for the future. The serum has been employed both intraspinally and intravenously by Bigelow (*Arch. Int. Med.,* June 23, 1919, No. 6, p. 723). This combined treatment is also recommended by Stone and Truitt (*Arch. Int. Med.,* March 15, 1919, 23, No. 3, p. 282), though they warn that if serum has been given intraspinally, great care is necessary in employing it intravenously to avoid anaphylactic symptoms. Whenever possible, Carter and Boyes (*Lancet,* June 21, 1919, 1, No. 25, p. 1065) advise the use of a serum of the particular type affecting the patient, the importance of this checking up with the agglutination test being also emphasized by Robison and Gerstley (*Jour. Amer. Med. Assoc.,* October 11, 1919, 73, No. 15, p. 1134).

A large number of observations made during the past year seem to support the view that this disease is primarily a bacteræmia and that it may be possible to recognize the disease in some cases before the meningitis develops.

EPIDEMIC ENCEPHALITIS

Epidemic or lethargic encephalitis (nona) has been reported as occurring in increasing frequency during the past year, having appeared in the United States, France, Belgium, Spain, Switzerland, Greece and Mexico.

The etiology of this disease is undetermined, although several observers believe that it bears some relation to influenza (Molinari, *Rif. Med.,* January 18, 1919, 35, No. 3, p. 50; Tucker, *Jour. Amer. Med. Assoc.,* May 17, 1919, 72, No. 20, p. 1448; Chartier, *Presse Méd.,* December 23, 1918, 26, No. 71; and Dragotti, *Policlinico,*

October 6, 1918, 25, No. 40, p. 952). This view is not universal, as Cruchet (*Paris Méd.,* June 14, 1919, 9, No. 24, p. 474) has seen cases before the pandemic was heard of, and Lhermitte (*Annales de Med.,* September, 1919, 6, No. 4, p. 306) does not regard it as a form of influenza, although he believes the latter may pave the way for the encephalitis. A large diplococcus has been isolated by Stafford (*Jour, Lab. and Clin. Med.,* August, 1919, 4, No. 11, p. 691), which he believes may be a factor in the causation of this disease, and Loewe, Hirschfeld and Strauss (*N. Y. Med. Jour.,* May 3, 1919, 109, No. 18, p. 772; *Jour. Amer. Med. Assoc.,* October 4, 1919, 73, No. 14, p. 1056, and *Jour. Infect. Dis.,* November, 1919, 25, No. 5, p. 378) have demonstrated the presence of a filtrable virus in the nasopharyngeal mucous membrane of patients suffering from epidemic encephalitis capable of producing the disease in monkeys.

Clinically the disease is characterized by an insidious onset, catarrhal symptoms, recurrent and incomplete paralyses, implication of cranial nerves confined to motor function, lethargy, drowsiness, frequently coma alternating with periods of irritability and anxiety, fever of $101°-102°$ F. in the early stages, lasting two to five days. In marked cases the lethargy is accompanied by heaviness of the eyelids, pain in the eyes, blurred vision, photophobia, headache, dizziness and in some cases diplopia and gradually developing stupor. In some instances there may be present a highly emotional state and in others mental depression simulating melancholia. In spite of the very alarming state of the patient recovery occasionally occurs, the proportion of fatal cases varying in the small series of patients reported by different observers (Special Article, *Jour. Amer. Med. Assoc.,* March 15, 1919, 72, No. 11, p. 794; Pothier, *Jour. Amer. Med. Assoc.,* March 8, 1919, 72, No. 10, p. 715).

The treatment is purely symptomatic, although Marinesco (*Bull. de l'Acad. de Med.,* November 5, 1918, 80, No. 44, p. 411) suggests the injection of convalescent serum into the arachnoid cavity. In view of the limited number of cases observed, the supply of convalescent serum would be exceedingly uncertain. The employment of hexamethylenamin by mouth and by vein is recommended by Lhermitte and De Saint Martin (*Bull. de la Soc. Med. des Hop.,* June 27, 1919, 43, No. 22, p. 607) and *Annales de Med.,* September, 1919, 6, No. 4,

p. 306); and Répond (*Rev. Med. de la Suisse Rom.,* May, 1919, 39, No. 5, p. 249) reports a case of recovery after two months in the hospital during which iodid treatment was pushed.

POLIOMYELITIS

The problem of chronic carriers of the virus of this disease is an exceedingly important one, and the recent investigations by Flexner and Amoss (*Jour. Exper. Med.,* April 1, 1919, 29, No. 4, p. 379) seem to point to the fact that while chronic carriers may exceptionally occur, the period of greatest infectivity is during the early stages of the disease.

YELLOW FEVER

A series of examinations and experiments have been conducted by Noguchi, which appear to establish the relationship between the leptospira icteroides, as he has termed the organism, and yellow fever (*Jour. Exper. Med.,* June 1, 1919, 29, No. 6, p. 547; July, 1919, 30, No. 1; August 1, 1919, 30, No. 3, p. 87 and 95) the experiments also showing that symptoms and lesions closely resembling yellow fever in man may be induced in guinea-pigs by the bite of female stegomyias that have previously sucked the blood of a yellow fever patient or an animal experimentally infected with this organism (*Jour. Exper. Med.,* October 1, 1919, 30, No. 4, p. 401). Noguchi's work has been reviewed by Arce (*An. de la Fac. de Med.,* Lima, January–February, 1919, 2, No. 7, p. 53), and by Lebredo (*Vida Nueva,* July, 1919, 11, No. 7, p. 145), who state that before his conclusions can be accepted the final proof of human inoculations and the cycle of evolution in the mosquito must be demonstrated.

SCARLET FEVER

The question of isolation is one of the most important in this disease, as in all of the acute contagious diseases, the tendency being to shorten the period in scarlet fever; Acosta (*Reper. de Med. y Cir.,* Bogota, December, 1918, 10, No. 3) deeming five weeks after the febrile period sufficient, and Bie (*Ugesk. for Laeger.,* June 19, 1919, 81, No. 25, p. 1011) could detect no difference in the incidence of this disease when the period of isolation was reduced from fifty-six to thirty-eight days.

PERTUSSIS

A definite knowledge of the contagious period in whooping-cough is of the greatest importance from the standpoint of prevention, but until our information in regard to the actual cause of the disease is more definite we must depend largely on clinical observations. From extensive research by himself and others, Lereboullet (*Paris Méd.,* January 11, 1919, 9, No. 2, p. 44) believes it has been demonstrated that this disease is contagious from the very first, but that the contagious phase does not last long, probably less than four weeks.

The best remedy for the prevention and cure of whooping-cough, Luttinger (*N. Y. Med. Jour.,* February 22, 1919, 109, No. 8, p. 322) believes, is pertussis vaccine when given in high doses and at proper intervals. Vaccine treatment was found to have an attenuating influence in some of the cases treated by Rueda Vargas (*Reper. de Med. y Cir.,* Bogota, July, 1919, 10, No. 10, p. 543) during an epidemic of unusual severity. Rapid improvement was observed by Vasconcellos (*Arch. Bras. de Med.,* April, 1919, 9, No. 4, p. 215) following treatment with a vaccine made from Bordet-Gengou bacilli. An autogenous vaccine has been employed by Bayma (*An. Paulistas de Med. y Cir.,* July, 1918, 9, No. 7, p. 145) prepared in a similar manner to the " antitossina " of Kraus, only he used the whole sputum instead of merely the threads of mucus. He considers it the most effectual means of treating whooping-cough yet known.

CHICKENPOX

A premonitory erythematous rash has been observed by Comby (*Arch. de Méd. des Enfants,* February, 1919, 22, No. 2, p. 57) in varicella, smallpox, measles, etc., preceding the principal eruption, which may suggest the possibility of a coincident scarlet fever when such does not exist. The possibility of a relationship between herpes zoster and varicella is suggested by Low (*Brit. Med. Jour.,* January 25, 1919, 1, No. 3030, p. 91).

MEASLES

A small round or very slightly elongated gram-positive diplococcus has been isolated by Tunnicliff (*Jour. Infect. Dis.,* February, 1919, 24, No. 2, p. 181), often in large numbers, and frequently the only

organism present, in the seventeen specimens of measles sputum she examined. The serum of measles patients was found to contain complement fixing bodies for these organisms (Tunnicliff and Brown, *Jour. Inf. Dis.,* December, 1918, 23, No. 6, p. 572). The blood from a measles patient has been injected into three monkeys by Sellards and Wentworth (*Bull. J. Hopk. Hosp.,* March, 1919, 30, No. 3371, p. 57) without results, and by Sellards (*Ibid.,* September, 1919, 30, No. 343, p. 257) into two men, who also proved insusceptible. A few cases have been inoculated with convalescent serum with the object of immunizing against this disease, by Richardson and Connor (*Jour. Amer. Med. Assoc.,* April 12, 1919, 72, No. 15, p. 1046) with results suggesting the success of the experiment.

DIPHTHERIA

The reliability of the Schick test was confirmed by the observation of De Elizalde (*Prensa Méd. Argent.,* March 30, 1919, 5, No. 30, p. 293), and his experience confirms its harmlessness and the absolute independence of the reaction from the condition of the general health. In a study of diphtheria at Camp Custer, Blanton and Burhans (*Jour. Amer. Med. Assoc.,* May 10, 1919, 72, No. 19, p. 1355) found a positive Schick test in 10.3 per cent. of the 7851 tests made; they also found 1.8 per cent. of carriers among 8286 individuals examined, and consider tonsillectomy as the final and only satisfactory method of disposing of chronic diphtheria carriers. Larger doses of antitoxin are advocated by Perretière and Bouchet (*Lyon Med.,* August, 1918, 127, No. 8, p. 352), and Piza (*An. Paul. de Med. e Cir.,* March, 1919, 10, No. 3, p. 49), the former also employing insufflations of antitoxins in the form of powder.

SCURVY

The difficulties attending the diagnosis of this condition are described by Comby (*Arch. de Méd. des Enfants,* May and June, 1919, 22, Nos. 5 and 6, pp. 225–281) in a careful analysis of sixty cases, and he lays stress on the importance of the routine administration of orange juice as a preventive to all children being fed sterilized milk. The disease has been produced in monkeys experimentally by Harden and Zilva (*Jour. of Path. and Bact.,* May, 1919, 22, Nos. 3–4, p. 246) by means of a diet of high caloric value but lacking the antiscorbutic

factor. An epidemic of scurvy in an institution, studied by Lind (*Med. Jour. Australia,* August 9, 1919, 2, No. 6, p. 107) leads him to believe that possibly in addition to the lack of certain vitamins, there may be a contagious infection present. Numerous articles have been published dealing with antiscorbutic properties of various foodstuffs and the method of preparation least likely to destroy this valuable property, among which the work of Chick and her associates are probably the most important (*Lancet,* August 23, 1919, 2, No. 5008, pp. 320, 322 and 323, and November 30, 1918, 2, No. 22, p. 735).

PELLAGRA

A study of this disease in an insane asylum by Zilocchi (*Gaz. degli Osped. e delle Clin.,* June 22, 1919, 40, No. 50, p. 510) leads him to conclude that it is the result of a too one-sided diet, and Roussel (*New Orleans Med. and Surg. Jour.,* December, 1918, 71, No. 6, p. 283) believes most of the cases of pellagra are of the scorbutic type. The investigation made by the R. M. Thompson Pellagra Commission of the disease in two small towns, reported by Siler, Garrison and MacNeal (*Southern Med. Jour.,* December, 1918, 11, No. 12, p. 786), lends support to the infection theory, while Nicholls (*Jour. Tropical Med. and Hyg.,* February 1, 1919, 22, No. 3, p. 21) believes both factors, dietetic and infectious, must be present.

BERI-BERI

A study of an outbreak of this disease among troops whose staple article of diet was polished rice, and who were spare or non-meat eaters, is described by Riddell, Smith and Igaravidez (*Jour. Amer. Med. Assoc.,* February 22, 1919, 72, No. 8, p. 569). That dietary deficiency merely acts as a predisposing cause for human beri-beri, is believed by Fraga (*Brazil-Med.,* March 1, 1919, 33, No. 9, p. 65), from his dietary experiments on convict volunteers.

PROGRESS OF SURGERY, 1919

By JOHN SPEESE, M.D.

CRANIOPLASTY

IT is possible to successfully close a gap in the skull by a graft of bone or cartilage and thus restore the integrity of the unyielding cranial vault. The operation is attended by little danger to life, as shown by the absence of mortality in the series reported by Primrose (*Annals of Surgery*, 1919, lxx, 1). The relief of symptoms directly dependent upon the existence of the gap is, as a rule, immediate and complete; thus headache, dizziness, the fear of injury and the sense of insecurity, occasionally the worry and mental depression dependent upon the possession of an ugly deformity, particularly in the forehead, are relieved. It is probable that when such a symptom as headache is not relieved, the trouble is dependent upon some condition additional to that of the cranial defect. The gratitude expressed by men who are relieved of these comparatively simple but most distressing maladies and who are rid of their deformity is sufficient guarantee that the operation is warranted.

The value of the operation in more complicated cases, more particularly those suffering from Jacksonian epilepsy, is less evident. Relief has been obtained in some of the cases, but no statement can be made as to the probable permanence of that relief. On the principle that we should remove all sources of cortical irritation, if possible, in such patients, one might argue in favor of the operation, but the graft itself may be a source of irritation, as evidenced in the case of one patient. In this instance a bone graft was removed and a fascial graft substituted with relief from the convulsions up to the present time, four months after operation. In the majority of the cases of Jacksonian epilepsy some measure of relief was undoubtedly secured. This would be explained by the relief of symptoms directly dependent upon the existence of the gap and the presence of the scar tissue causing cortical irritation. Therefore, the gap should be closed

in these cases in order to eliminate the symptoms due to the existence of the defect and with the hope that in addition the epileptic seizure may be ameliorated.

The effect of operation on such symptoms as defective vision, aphasia, loss of memory, deafness and other symptoms dependent upon organic cerebral lesions is of little or no value.

The value of the fascial graft is well worth considering. Where there is a cortical irritation, with much scar tissue implicating the dura mater, it is most serviceable to make a free dissection of the cicatricial tissue, removing the patch of dura mater involved and substituting a patch of fascia lata to close the rent.

Finally, it is concluded that where a gap exists in the cranium it should be closed. The symptoms caused by the existence of the gap and directly dependent upon it will almost certainly be relieved by a successful cranioplasty.

Before attempting to remedy a defect in the skull, Wilson (*Annals of Surgery,* 1919, lxix, 230) states that it is important to make a thorough examination of the patient with especial reference to the nervous system. Many of these patients suffer from functional disturbances, which may or may not be relieved by the surgical procedure. Some are so mentally deficient that operation would be unjustifiable; there may be a deep-seated lesion which could not be benefited by restoring the protective covering. Foreign bodies should be removed, if possible, but it must be kept in mind exactly what is to be expected from the operation. Only those symptoms which can reasonably have a causal relationship with the pathological conditions remedied can be expected to be cured or relieved. At least three months should elapse after the healing of the wound before interfering, as earlier operations are attended by the danger of setting free latent infection. In any case, it is well to bear in mind that the longer the period of suppuration the longer should we wait before attempting to repair the defect by any grafting operation.

The methods used to close cranial defects are (1) bone grafts, (2) metallic plates, (3) cartilaginous grafts. Favorable results have been reported by all these methods. The technic of the last-named method is as follows: An elastic tourniquet is tied around the base of the skull, a flap of skin, including the epicranial aponeurosis, is turned down. The pericranium is incised around the cranial defect

and stripped up in both directions. The inner strip is freed to the margin and then the scar tissue adherent to the edge of the defect is likewise pushed inwards until the dura is exposed. The latter is freed and spicules of bone, if present, released. The outer table is removed for a distance of three-eighths of an inch around the opening in order to make a shelf upon which to place the graft. The latter is removed through a six-inch incision which splits the rectus abdominis. The muscle is retracted, the cartilage of the sixth, seventh and eighth ribs exposed and a suitable graft removed. The graft should be removed in one piece and be uniform in thickness, and the smooth perichondrial side placed next the brain. The graft is placed on the prepared shelf, beneath the pericranium, which is stitched to the cartilage by means of chromic catgut. In large defects additional grafts must be sutured to the pericranium and the main graft, after all hemorrhage is controlled. The skin flap is sutured with silkworm catgut and a small drain inserted for forty-eight hours.

CANCER OF THE SUPERIOR MAXILLA

Cancer of the upper jaw, and especially in the maxillary antrum, remains a local disease until comparatively late, nor does it tend to metastasize to the degree of cancer elsewhere. Schley (*Annals of Surgery,* 1919, lxix, 8) believes the poor results in the treatment of this affection are due to the great malignancy of these cancers, the late stage of the operation, and often to incomplete primary operation.

The operability of the disease is not always easy to determine. It is not invariably its extent that must determine this point. Its variety, malignancy, chief situation and apparent and probable direction of extension and condition of the patient must all be weighed. Thorough preparation and proper technic produces an operative mortality of 12 to 13 per cent. Cases that have been tampered with by local cauterization, electricity and incomplete excision have proved the most malignant. Within the antrum suppurative conditions may mask a coexistent or causative malignancy. A number of these growths appear to start in a nasal or antral polyp, and not infrequently a portion, removed for diagnosis, does not go deep enough to show the major condition.

When we compare the results of operations for the removal of tumors of the upper jaw with the knife alone with the results of the

removal of identical tumors with the cautery, Bloodgood (*Southern Medical Journal*, 1919, xii, 248) finds that the mortality is distinctly reduced, and when cures have been accomplished it has been with less mutilation. The actual number of cures has not been demonstrated at the present time.

The reduction in mortality is associated with the employment of local anæsthesia alone, or in combination with light chloroform general anæsthesia. In many instances it is safer to remove the disease involving the upper jaw in stages, and much can be done under local anæsthesia alone.

When the cautery is employed it is possible to remove the tumor piecemeal and to destroy from tumor tissue into the surrounding healthy tissue without danger of dissemination, while with the knife one must give the tumor tissue a wide margin and remove the entire mass *en bloc* at one operation.

In the removal in stages with the cautery it is also possible to have a pretty positive microscopic control as an indication that enough has been done. The new growth should be attacked with the cautery from two points. The tissue at the border of the tumor should be cauterized, for this not only destroys the infiltrating area but excites in the healthy tissue beyond a granulation tissue which of itself is largely protective against secondary invasion. The second attack should be upon the new growth itself, if possible, from the centre out.

Exploration of the antrum through the face in the early stage of carcinoma, and the destruction of the growth in the antrum with the cautery offers a hope of a permanent cure, even in the more malignant types of carcinoma and sarcoma.

CANCER OF THE TONGUE

In the Bradshaw Lecture for 1918, Power (*Brit. Jour. of Surgery*, 1918, vol. vi, 336) believes that the following conclusions can be safely arrived at from the evidence obtained. Cancer of the tongue has always existed in men and in animals, the actual cause being, as yet, unknown. Its rapid increase in men within historical times is the result of two causes: the first predisposing, the second exciting.

The predisposing cause is the degenerative change taking place as the result of spirochætal infection, the change being accentuated by lapse of years and by indulgence in alcohol. The exciting cause is

local irritation. The most effective local irritant is tobacco, although pyorrhœa and carious teeth often act as minor exciting causes. The exciting causes may act for long periods of time, but will not produce cancer, except in the rarest instances, without the long-continued action of the predisposing cause—syphilis. The occasional occurrence of cancer of the tongue in animals and in non-syphilized people shows that, as in cancer generally, there is a *tertium quid,* as yet undiscovered, which is called, for convenience, the predisposition to cancer. This predisposition manifests itself in the varying resistance to cancer shown by different persons.

This so-called predisposition should be studied by correlating historical, clinical and pathological results, for it is only by a wide survey on all sides that it is possible to discover where experimental research is likely to be most useful.

The points of practical importance obtained from the study lead the writer to the conclusion that it ought to be possible to reduce cancer of the tongue to the subordinate position which it occupied before the seventeenth century in men and which it still holds among the domesticated animals.

At the present time syphilis is more prevalent than it has been for many years and the consumption of tobacco has risen greatly. Much of this tobacco is smoked in the form of cigarettes, and women now smoke on a much larger scale than they used to do. It follows, therefore, that if matters are allowed to continue as they are doing, there will be a high increase in the number of persons suffering from cancer of the tongue. The increase should begin about 1950, and it should affect women as well as men.

Such an increase can be prevented by a thorough and systematic treatment of syphilis in its initial stages; for, as has been shown, cancer of the tongue has always increased in frequency some years after syphilis has been treated inadequately. Persons who are being treated for syphilis, therefore, should be told never to smoke, nor to drink to excess, and to visit the dentist regularly.

Such advice should be given while the patient is actually under treatment for syphilis. It is useless to defer it until the tongue has become sore, because it is then too late in a large number of instances. Many patients, of course, will say that they would rather run the risk of having cancer of the tongue than be restricted in the use

of tobacco. It may be so, but at any rate it is our duty to put the matter plainly before them, and to point to the risk they run, in the hope that a few will take advice and be saved from a painful disease and a miserable death.

POST-OPERATIVE PAROTITIS

While secondary parotitis occurs more frequently after operations on the genitalia, especially in the female, yet it is Deaver's (*Annals of Surgery,* 1919, lxix, 128) belief that the type of operation, that is, the organ or organs operated upon, plays a minor rôle in the phenomenon of post-operative parotitis, and that the cases may be attributed either to peculiarities of the pathology encountered, to local conditions, or to post-operative wound infection.

The affection may be classed in three groups: metastatic, occurring only in pyœmic conditions; ascending parotitis, due to ascending infection via the excretory ducts, and traumatic, the result either of direct pressure on the parotid gland or the forcible manipulation of the jaw by the anæsthetist during operation.

Infection may be carried to the gland by way of the lymphatics from diseases of neighboring structures, by way of the blood-stream, by way of the excretory duct of the gland. The majority of cases, in recent times, have occurred after severely infected conditions, appendicitis, peritonitis, perforating gastric ulcer, etc., the complication, therefore, arising from infection which has existed and has been active for some time, and, owing to incomplete or careless surgery, secondary infection takes place.

RECURRENCE OF EXOPHTHALMIC GOITRE AFTER THYROIDECTOMY

A study of the case histories of patients suffering from recurrence has led Sloan (*S. G. O.,* 1919, xxix, 148) to believe that in many instances, if not always, the exciting cause of the exophthalmic goitre and of its recurrence will be found to be an infection, usually focal in character, which must be eradicated before cure is possible. These observations on the relation of chronic infection to exophthalmic goitre have altered the author's method of procedure in primary severe cases. Focal infections are eradicated first, if possible; if not, then as soon as possible after the ligation or lobectomy, thus attacking the disease at its origin. Most frequently the infection has been located

in the nasopharynx and mouth. The history of recurrent sore throat with the presence of enlarged deep cervical nodes is considered sufficient evidence to justify a tonsillectomy. The condition of the teeth should be closely scrutinized, and if a root abscess is shown by the X-ray, the tooth extracted. Several days after the eradication of the focus of infection, the superior thyroid arteries are ligated, the patient then sent home to carry out a carefully planned dietetic régimen with complete rest for two or three months before thyroidectomy.

CONGENITAL PYLORIC HYPERTROPHY

Gray and Pirie (*Lancet,* September 20, 1919, 526) conclude from their statement that congenital pyloric hypertrophy is the result of prolonged ante-natal spasm induced by hyperadrenalism. Pyloric obstruction is completed by two secondary influences: (*a*) Retention gastritis with consequent swelling of the mucosa; (*b*) added spasm, due to several causes—foremost by phimosis. The final results of the closure of the pyloric orifice are (*a*) absence of acid chyme in the first part of the duodenum, leading to (*b*) failure of secretion formation, leading to (*c*) suppression of pancreatic secretion. These factors themselves further induce inhibition of the normal pyloric relaxation and establishment of the " vicious circle."

Positive diagnosis should never be made without the demonstration of a palpable tumor. Rammstedt's method is the operation of choice, and fulminating cases demand immediate operation.

In all other cases palliative treatment should first be adopted; peptonized milk in appropriate quantities, gastric lavage, circumcision, subcutaneous infusion of saline and 2 per cent. glucose when necessary and possibly administration of chloral hydrate. Palliative measures in very wasted infants should be abandoned after forty-eight hours if the symptoms are not relieved and operation performed. In the majority of cases palliative treatment is to be persevered with for from two to twelve days. The critical time at which failure or success of palliative-treatment can be gauged is from ten to twelve days from the commencement of the treatment, and coincides with the re-establishment of pancreatic function in successful cases. Failure to improve after this point constitutes an indication for operation in boys but not necessarily in girls.

Sex incidence is about equal; phimosis being the determining fac-

tor in the onset and severity of symptoms in a large proportion of male subjects of pyloric hypertrophy.

Kerley (*J. A. M. A.*, 1919, lxxii, 16) records twenty-six cases operated on by the Rammstedt method. In the cases reported seventeen were boys and nine were girls. Twenty-three patients were entirely breast-fed at the onset of vomiting, and nine were entirely breast-fed when they came under observation. The vomiting in all was projectile. Twenty-three had vomited after every feeding. The peristaltic stomach wave was present in every case and was best obtained by washing the stomach and allowing two ounces of water to remain or to give two ounces of food. Tumor was palpable in all the cases but one.

A low mortality in these cases depends on early diagnosis and immediate operation. The presence of a palpable tumor demands prompt surgical interference. The longer operation is delayed in a case with a well-marked tumor the greater the surgical risk. Operation by the Rammstedt method will insure a mortality of about 5 per cent. in patients that have not vomited more than two weeks.

Hill (*Missouri M. J.*, 1919, xvi, 379) has dealt with 25 cases with 16 recoveries and 9 deaths. Of this number 14 were operated on by posterior gastroenterostomy, with only 6 recoveries. Eleven cases were operated on by the Rammstedt method, and 10 have recovered.

LOCAL ANÆSTHESIA IN ABDOMINAL SURGERY

Some of the advantages of local over general anæsthesia, as enumerated by Farr (*J. A. M. A.*, 1919, vxxiii, 391) are safety and comfort of the patient and the efficiency of the anæsthetic. In local anæsthesia the use of epinephrin and the possibility of doing more deliberate work gives one a control over the blood supply that is superior to that offered under general anæsthesia. The distended and engorged vessels so frequently seen during general anæsthesia are uniformly collapsed during local anæsthesia.

The dangers from sepsis probably differ very slightly in the two forms of anæsthesia. The placid condition of the viscera, under local anæsthesia, possibly gives one technical advantages. In the cases of localized abdominal infections it is not uncommon to see a spread of the infection result from the struggles of the patient while going under or emerging from general anæsthesia.

The viscera may not be delivered or displaced and handled as readily, distant digital explorations are not so easily made, and adherent masses are not so easily dealt with. However, if we confine the use of local anæsthesia to the class of cases in which it is indicated, and if we agree that, to a large extent, visual rather than digital exploration should be made within the abdominal cavity, local anæsthesia compares favorably in offering adequate exposure.

Assuming that the amount of hemorrhage and trauma are reduced by the use of local anæsthesia, the natural inference would be that there would be less shock following operations performed under local anæsthesia. The absence of thirst, nausea and vomiting, with their resultant dangers, the low percentage of gas pains, which occur almost directly in proportion to the amount of trauma inflicted by abdominal packs and handling, are in marked contrast to that which takes place in patients who have been operated on under local anæsthesia.

Technic.—The local anæsthetic of choice is procain 0.5 per cent. in Ringer's solution combined with epinephrin, 5 drops to the ounce. In all except hernia cases, direct infiltration of the abdominal wall is made, and all layers are infiltrated before the incision is made. A pneumatic injection is employed, giving a constant flow of the solution with a steady pressure. With this instrument the ordinary abdominal wall can be anæsthetized in from two to three minutes. The article is concluded with a discussion of the abdominal operations which safely can be performed under local anæsthesia.

HIRSCHSPRUNG'S DISEASE

This disease is regarded by Carr (*Pa. Medical Journal,* 1919, xxii, 1705) as a congenital anomaly, which may or may not show its clinical symptoms at birth. Hirschsprung distinguished two groups of cases: (1) Those seen at birth or shortly after, and (2) those which develop later, about the time of weaning or toward the end of the first year of life, corresponding to the time of change in the character of the food. Hirschsprung's statement that the disease is entirely limited to the colon is not absolutely true, although typical cases are found in the sigmoid portion of the colon and in the transverse colon. There may be distention of the cæcum or rectum and in rare cases there may be a dilatation of the colon without involvement of the sigmoid.

Congenital megacolon is three times as frequent in boys as in girls. Of the early symptoms abdominal distention may be observed at birth, and it may be excessive enough to retard labor, but the most important symptom is the non-passage of meconium, which may not be passed for two or three weeks. Constipation is always a definite symptom and one of much importance in older children. The fecal material accumulates in such quantities as to cause fecal tumors, especially in the sigmoid. Protracted constipation may be relieved spontaneously by the expulsion of great masses of fecal material, or it may yield to enemata or mechanical stimulation, which will cause the passage of fecal matter for three or four days, but after this free discharge constipation recurs.

The prognosis is unfavorable for the duration of life. The majority die before the sixth year, and ten years appears to be an unusual survival. With operative interference life is probably prolonged, but the statistics are not complete in this particular. Colostomy is objected to because of its high mortality; colopexy in eight cases gave no mortality, and three patients were reported cured by this method of lifting the sigmoid and fastening it so as to eliminate kinks. Resection has been done forty-three times; in one-stage operation 56.5 per cent. were cured with mortality of 26 per cent.; in two-stage operation 90 per cent were cured, mortality 5 per cent.

DIAPHRAGMATIC HERNIA

It is the belief of Soresi (*Annals of Surgery,* 1919, lxix, 254) that small hernias through the diaphragm are more frequent than is commonly thought, and that the subject has received too little attention by the internist and the surgeon. In cases suffering from obscure abdominal symptoms, the possibility of this type of hernia must be considered, and at operation, the surgeon should explore the diaphragm carefully and systematically, even as he explores all the abdominal organs.

The symptomatology of the affection is quite complex, because it depends on many factors: the point where the continuity of the diaphragm is broken, the organs that pass through the opening; the portions of these same organs; the relations or adhesions that these organs might contract between the various organs passing through the diaphragm or the organs situated in the thorax, or with the dia-

phragm itself; the permanence of the herniated organs above the diaphragm; the compression on the organs by the diaphragmatic opening; action of the hernia on the thoracic organs, and changes induced by eating and drinking. While the X-ray confirms the presence of the large hernias, it is of little value in the smaller ones, and it is this type which causes such a variety of obscure symptoms.

The classical manner of dealing with diaphragmatic hernia is to operate from the chest, but the abdominal route is safer and more rational in most cases. As these cases are generally diagnosed during laparotomy, it would be a useless and dangerous procedure to open the chest when the hernia can be completely reduced and its reproduction prevented by operating through the abdomen. The chest route should be reserved for those cases in which the herniated organs have contracted strong adhesions, on account of which their liberation is not possible through the abdomen; that is, they cannot be freed without causing serious damage either to the herniated organs or to the organs with which they have contracted adhesions. If it is necessary to open the chest, intercostal incision with strong retraction of the ribs affords sufficient exposure to examine the condition of the herniated organs. The main dangers are shock and laceration of important structures. Shock can be prevented by avoiding any pulling on the organs to be reduced or those organs in the chest and avoiding all unnecessary traumata. The organs are freed by clean and sharp dissection and not by tearing. The author concludes his article by describing the method of closing the diaphragm.

GALL-BLADDER

Magie (*S. G. O.*, 1919, xxviii, 462) makes a plea for saving the gall-bladder in at least a majority of cases operated on for lesions of the gall-bladder. Physiologists, as well as surgeons, are of the opinion that the gall-bladder has a function, and when we admit this, we are compelled to admit that the function, whatever it may be, should be conserved.

In the writer's experience, the gall-bladder should be drained in all cases of acute cholecystitis of only a few days' duration; also some cases of acute cholecystitis that have had previous attacks, provided the gall-bladder walls are not much thickened and free from adhesions that would indicate previous serious attacks, provided also that the

cystic duct is open and the bladder contains bile. Many acute gall-bladders contain but little bile at operation, due to swelling of the cystic duct, but within a day or two after drainage is established and sufficient time has elapsed for the swelling to have been reduced the bile escapes freely.

All cases of simple cholelithiasis, where the gall-bladder shows little signs of ever having been infected and where exploration of the interior shows a comparatively healthy mucous membrane, should be treated by the conservative form of operation.

INTESTINAL OBSTRUCTION

Intestinal obstruction following purulent appendicitis and peritonitis should be treated by enterostomy, according to Hageboeck and Kornder (*J. A. M. A.*, 1919, lxxii, 1066). Their indications for the operation are a drumlike distention of the abdomen associated with uncontrollable black vomiting, particularly when no relief is obtained by gastric lavage, the existence of complete obstipation which in no wise yielded to any enema (the pulse and temperature play only a very negligible part in deciding on an enterostomy); the chief and most important indication is any marked diminution in the amount of drainage from the wound.

If there is not a general improvement of the patient with the decrease in drainage, the surgeon should be in readiness at any time to perform an enterostomy. An anæsthetic is not necessary since the abdominal wound is open and the bowel can be reached easily. The one essential, absolutely necessary, is that the fistula be made in a distended or bulging portion of the bowel.

Of fifty cases, in twenty-seven of which there were spontaneous or artificially induced fecal fistulas, seventeen healed spontaneously. In these, at the time of the secondary operation, it was only necessary to repair the original abdominal incision. In ten cases only it was necessary to repair the intestine at the secondary operation.

ARTERIOMESENTERIC ILEUS OF DUODENOJEJUNAL FLEXURE

Fisher (*Annals of Surgery,* 1918, lxviii, 582) divides this type of obstruction into three clinical varieties: (1) Organic ileus; (2) acute arteriomesenteric ileus; (3) chronic arteriomesenteric ileus.

In the cases of the first clinical type the factors that produce it

and the pathology are self-evident. In the second variety there is no evidence of pathological conditions to explain the obstruction other than the unusual anatomical factors. The inhibiting influence of narcotics given to relax patient is a contributing factor in the production of gastroduodenal stasis, dilatation with tension ensues and with tension regurgitation. The greater the dilatation the greater the tension, and the greater the tension the less propulsive force of duodenum and the greater the obstruction at flexure. The duodenojejunal flexure ceases to be a normal physiological one and becomes an occlusion, produced by innervation of musculature with duodenal tension.

In the third clinical type there can be no doubt that the obstruction by the root of the mesentery and by the superior mesenteric artery is a real one, but there are difficulties in explaining the conditions that bring about such an obstruction. Certain things are obviously necessary; if the mesentery is to pinch the duodenum, it must be tight and there must be traction in a certain direction. These conditions are fulfilled by the small intestine being in the true pelvis and being empty; it cannot be in the pelvis unless it is empty. Apparently the mesentery must be neither too short nor too long in order to constrict the duodenum.

Treatment of the first type is entirely surgical and the operative technic dependent upon the cause. Where possible, growths should be excised, strangulated hernia relieved, etc. When not possible to remove cause and relieve the occlusion, the duodenum should be drained to prolong life, or in expectation of permanent recovery duodenojejunostomy is indicated.

In the second type, if unrelieved by lavage, the duodenum should be drained in urgent toxic cases. In less toxic cases a duodenojejunostomy should be performed. In the third clinical type, medical treatment has been abandoned, and duodenojejunostomy has become the operation of choice.

STOMACH

The most common cancer is that of the stomach. According to C. H. Mayo (*Annals of Surgery,* 1919, lxx, 236) more than one-third of the cancers in men and more than one-fifth of the cancers in women appear in this organ. Nearly one-half of such patients are inoperable,

indicating there is room for improvement in the matter of securing earlier recognition of the disease. The gain will be comparatively small over present conditions, because in many instances the disease gives but few symptoms until it is far advanced and because approximately 75 per cent. of cancers of the stomach are so located or of such a type that early metastasis takes place into the glands and into other organs, or it may become grafted throughout the peritoneum; to prevent this, early operation is essential. About one-fourth of gastric cancers are confined to the stomach, and in this group, if glands are involved, they are in or connected with its wall without papillary outgrowth. These are the most favorable cases for operation, and yet all of this type are not operable for various reasons: advanced age, general debility, complicating diseases or extensive involvement of the stomach. In the inoperable group may be placed the cases involving the cardia, approximating 10 per cent. of the gastric cancers.

For the last three years the anterior Pólya operation has been done, the original Kroenlein instead of the posterior, bringing the loop of jejunum over the transverse colon. The posterior Pólya was abandoned because of primary obstructive complications due to adhesions, to tension from gastric traction, or to late trouble from recurrence of the malignancy with early obstruction. The anterior operation gives an easier convalescence on the average. Better after-results are secured by turning the bowel to the right, isoperistaltic, which was a marked feature in the earlier operations of anterior gastroenterostomy. The point of attachment of the jejunum is approximately fourteen inches from its origin, while the opening in the stomach comes directly over the descending leg of its loop, the reverse of the Mikulicz partial closure and button anastomosis. The transverse colon naturally sags in its mid-portion; by turning the bowel from left to right it is brought to the left of the centre, while the stomach delivers along its lesser curvature the more fixed portion of the viscus. Inasmuch as the tissues of the stomach are more or less devitalized by disease and more so by the operation, the suture material recommended is silk for the outer row and chromic catgut for the inner row; the silk guards against separation from delayed healing. The completed operation can be made within one hour.

The data bring the results of operation up to September 1, 1917;

427 patients were operated on during the three years previous to September, 1917. Those who died in the hospital and those not heard from number 121. Those who recovered from the operation and who have been heard from number 306; 115 (37.6 per cent.) of these show three-year cures. Three hundred and thirteen patients were operated on during more than five years before September 1, 1917. Those who died in the hospital and those not heard from number 79. Those who recovered from the operation and who have been heard from number 234; 59 (25 per cent.) of these show five-year cures. This is a most satisfactory showing for the surgical relief of an otherwise hopeless condition which is attended by much suffering.

ULCER

Hemorrhage following operations for both gastric and duodenal ulcer is of sufficient frequency (2 per cent. in duodenal ulcer and 1 per cent. in gastric ulcer) to warrant a revision of operative methods in such cases, according to Balfour (*J. A. M. A.,* 1919, lxiii, 571). Gastroenterostomy or pyloroplasty alone does not always protect against further hemorrhages, while excision of the ulcer and gastroenterostomy gives almost total protection. Excision by cautery combined with gastroenterostomy is the most satisfactory method in the majority of cases of minimizing the possibility of recurrence of hemorrhage in all ulcers which have been associated with hemorrhages, and similar treatment seems advisable in both gastric and duodenal ulcers which have not exhibited such a complication.

THE RESULTS OF SPLENECTOMY IN THE ANÆMIAS

The operation of splenectomy has been given a fair trial in three types of the anæmias—splenic anæmia, pernicious anæmia, and hæmolytic icterus, and its success or failure, therefore, may be shown from the data collected by W. J. Mayo (*Annals of Surgery,* 1919, lxx, 22).

It would appear that the spleen, acting as a filter, removes noxious agents, both microörganisms and chemical toxins, from the bloodstream and sends them to the liver for destruction; in certain instances cirrhosis of the liver, as well as fibrosis of the spleen, results from the chronic irritation produced by such substances. If the spleen is unable to rid itself of these toxic agents, splenomegalia and

anæmia result with sequestration of the agents in the spleen, but the liver is not necessarily cirrhotic.

If the spleen is removed early in splenic anæmia, the liver will probably not show serious evidence of disease later, and even when cirrhosis of the liver is well marked and ascites is present, splenectomy often effects a " near " cure, by relieving the liver of its overload of blood and reducing the labor sufficiently to enable it to meet its demands. The spleen was removed in 61 cases of splenic anæmia, with a mortality of 11.7 per cent., the disease occurring in patients operated on in a later stage of the disease, in which there was a high grade of anæmia, ascites and cardiorenal manifestations.

Splenectomy in pernicious anæmia does not appear to be based on sound reasoning, and there seems to be no foundation for the belief that the procedure will cure the disease. There is, however, great, though temporary improvement, gain in weight, and an increase in hæmoglobin from 58 to 72 per cent., and the reds from two to four million. In young and middle-aged persons in whom the disease is most rapid, especially if hæmolysis is known to be marked, splenectomy is worthy of trial. As a whole, it may be said that whenever pernicious anæmia has developed to a stage in which the blood is characteristic it is incurable, and splenectomy is a means of palliation and not a cure.

The characteristic features of hæmolytic icterus are an enlarged spleen, chronic jaundice with exacerbations, normally bile-colored feces and absence of bile in the urine. It is certain that in hæmolytic icterus the spleen destroys, unnecessarily, the red corpuscles. The enlargement of the spleen may be in the nature of a work hypertrophy. In hæmolytic icterus the enormous destruction of red corpuscles in the spleen inundates the liver with blood pigments and renders the bile thick, and under such circumstances a liver which has a superabundance of work of a certain kind thrown upon it may deposit pigment throughout its tissue, thus producing many of the patterns which are given as varieties of biliary cirrhosis.

The triumph of splenectomy is the cure of hæmolytic icterus, only patients in a terminal condition with secondary gall-stones and cirrhosis of the liver fail to be relieved. The only patient lost out of the 27 splenectomized for hæmolytic icterus was one operated on during an acute exacerbation.

According to the latest conception of Banti's disease, Kristjanson (*Wisconsin Medical Journal,* 1919, xviii, 125) states that its etiology is unknown. Bacteriological examinations and animal inoculations have all proved negative. The course of the disease and the fibrosis of the organ seem to suggest a chronic intoxication, possibly originating in the spleen. This theory is apparently supported by the great improvement, if not actual cures in some cases, after removal of the spleen.

Immediately after removal of the spleen in an early case of Banti's disease, implants of the organ were placed on various culture media, and after ten days' inoculation, very small grayish colonies were seen, from which clumps of coccoid organisms were obtained on microscopic examination. This organism is apparently closely related to, if not identical with, the diphtheroid bacillus constantly found in frank cases of Hodgkin's disease.

The effects produced on dogs by repeated intravenous inoculations with the organisms were marked systemic reactions indicated by rise in the temperature and leucocytosis, progressive enlargement of the spleen with gradually increased fibrosis and perisplenitis. The histological changes in spleens were quite like those in early Banti's disease.

Giffin (*Medical Record,* 1918, 94, 1020) reports the results on 20 patients with myelocytic leukemia who have been splenectomized; 18 of them after preliminary treatment by means of radium exposures over the spleen. The spleen and the leucocytic count were, by means of radium, very much reduced, and the general condition of the patient was greatly improved. One patient died, an operative mortality of 5 per cent. The operative mortality of cases reported in the literature in which little or no preliminary treatment had been given was 86 per cent.

Ten of the 20 patients are living in good general condition from nine months to one year and seven months following splenectomy. Of 7 patients operated on within six months of the time of onset of the disease, 6 are alive. It is probable that, at least in certain chronic types of myelocytic leukemia with fibrous spleens and relatively low leukocytic counts, splenectomy may be justifiable for the comfort of the patient.

In performing splenectomy for Banti's disease, Losio (*Presse*

Medical, 1919, xxvii, 415) urges the complete removal of the spleen, and warns of the danger of leaving portions behind. Search must be made for supernumerary spleens, and, if found, they should be removed. As the spleen is the organ primarily affected in the disease, its extirpation is recommended in any case in which the liver may become secondarily the seat of cirrhosis.

LYMPHATIC TISSUE

According to Levin (*Annals of Surgery,* 1919, lxx, 561) *Hodgkin's disease and lymphosarcomata* are more promptly influenced by *radium and X-rays* than any other tumor. The affected lymph nodes diminish rapidly in size and with it there is a marked improvement in the general condition of the patient. Besides the affected nodes, the spleen should be subjected to the same treatment.

The treatment of these conditions should continue for months. Should the treatment be interrupted for a time, then at the first evidence of a new enlargement of the nodes the treatment must be repeated. Unsatisfactory results are probably due to the fact that radium and X-ray treatment is attempted only late in the course of the disease and is not pursued with sufficient energy. In a few early cases the writer succeeded in arresting the disease for a number of years. While Hodgkin's disease presents on the whole a hopeless condition, the results of radium and X-ray treatment are extremely encouraging, and should be employed in every case as soon as the diagnosis is made.

BLOOD TRANSFUSION

The indications for transfusion are well established, and the various methods have become more and more simplified. At present the aim of most observers has been directed toward the elimination of and study of the dangers which have followed transfusion. Many of the unfortunate complications would have been avoided if the preliminary tests had been more thoroughly carried out. Pemberton (*S. G. O.,* 1919, xxviii, 262) emphasizes this fact in his report of 1036 blood transfusions. In twelve cases there were group reactions, which error could be traced in every case in which the blood had been grouped by the microscope. Such reactions, due to the injection of incompatible blood, is attended by the development of grave symptoms,

which, if not recognized early and the transfusion concluded before the injection of a large quantity of blood, may be followed by fatal results.

Unger (*J. A. M. A.,* 1919, lxxiii, 815) states that there is a far greater number of reactions following transfusions with citrated blood than with unmodified blood. This is due to alterations in the blood-cells, the platelets undergoing early coagulative changes. Sodium citrate acting as a harmful foreign substance renders the blood-cell more fragile and more easily hæmolyzed. This undesirable result is of especial importance in hæmolytic disease. Transfusion of whole, unmodified blood is the procedure of choice when blood is required as a tissue. When it is wanted merely to replenish an impoverished circulation with an adequate supply citrated blood may serve as a substitute. The onset of hypertransfusion is evidenced by the patient's giving vent to short sharp coughs, which is a danger signal of value, and the giving of more than about 200 c.c. of blood, thereafter, may be followed by fatal results.

Garbat (*J. A. M. A.,* 1919, lxxii, 1) finds from his experience that the citrate method compares, as to its favorable results, with other methods using unmixed blood. There seems to be no doubt, however, that the citrate method is followed more often by chills, and Drinker and Brittingham (*Archives of Internal Medicine,* 1919, xxiii, 133) have shown that transfusion of citrated blood from which the platelets have been separated is followed by a lessened percentage of chills than transfusions of citrated blood with platelets.

Blood transfusion may favorably influence the course of many diseases other than hemorrhage and anæmia, in which the indications are not so apparent. Lindeman (*J. A. M. A.,* 1919, lxxiii, 896) cites numerous examples to prove the above statement. He does not regard the fulminating vicious types of infection, such as occur in the puerperium or the acute variety in which death occurs within a few days, as favorable types for treatment, for these conditions become fatal before the treatment becomes operative. So, too, the results obtained in malignant endocarditis with streptococcus viridans bacteræmia are not encouraging.

In long-standing cases of sepsis, even with bacteræmia, the patient will frequently arrive at the point at which he has just enough protection to prevent further advance of the infection temporarily. Dur-

ing this stage there may be very little or a moderate or a severe grade of anæmia, malaise, debility, sapræmia and poor nutrition. This is a critical period and all measures should be directed toward increasing the patient's resistance. Blood transfusion controls the infection, sapræmia is reduced and granulations are stimulated.

Cases are cited to show the effect of transfusion in pernicious anæmia, tropical sprue, gas poisoning, nephritis, leprosy, aleukemic leukæmia, sepsis and hemorrhage.

The results of transfusions of citrated blood is well observed in the table compiled from Lewisohn's (*American Journal of Medical Science,* 1919, clvii, 253) records.

	No. of Cases	No. of Transfusions	Cured	Improved	NotImproved	Unknown	Died
1. Hemorrhage:							
a. Hæmophilia and allied conditions	14	15	11	..	..	..	3
b. Purpura	16	20	4	..	..	..	5
c. Gastro-intestinal hemorrhage	11	20	2	5	..	2	8
d. Cholæmia	5	11	..	1	..	..	5
e. Postoperative hemorrhage	13	16	6	..	..	..	7
f. Hemorrhage from female genital organs	2	2	..	..	..	..	2
g. Traumatic hemorrhage	2	3	1	..	..	..	1
2. Diseases of the Blood:							
a. Pernicious anæmia and leukæmia	24	39	..	7	4	..	13
b. Primary and secondary anæmia	4	7	3	1	..	..	5
3. Preoperative and postoperative transfusions	35	39	12	..	..	..	23
4. Sepsis	..	..	..	..	..	..	..
5. Incurable conditions (transfusions performed at request of family)	12	12	..	..	..	..	12
6. General debility	6	8	..	1	..	1	4
7. Acute poisoning	1	1	1	..	..	..	..
Totals	150	200	40	15	4	3	88

INJURIES TO THE BACK

Cases with such injuries frequently are seen by the surgeon weeks or months after the accident. The subject of etiology is thoroughly discussed by Wallace (*Pa. M. J.,* 1919, xx, 648). (1) The traumatic or flat-back variety may be divided into acute types in which the trauma is recent or primary. (2) The chronic variety is that type

in which the trauma is recurrent and of longer duration. This variety is generally the result of neglect and improper treatment, adhesions forming and muscles contracting from such neglect, holding the patient in improper position. The trauma may be the result of a direct blow or indirect muscle action.

In the static or hollow back group we have any cause which will produce a loss of muscle tone and consequent strain and relaxation of the ligament and joint capsule, as (1) in young girls with poor musculature, (2) in disease of the nervous system, anterior poliomyelitis, the dystrophies, tabes, (3) in pendulous abdomens, whether due to excessive adiposity, intra-abdominal or pelvic tumors and displacements, further static conditions, such as unequal length of limbs and joints of the extremities ankylosed in faulty positions.

In the toxic group, inflammatory symptoms predominate, constant irritation and strains of the joints have a lower resistance and congestion, upon which infection or toxæmia may be implanted, or we may have a direct extension of an inflammatory process from the pelvic organs.

In the traumatic variety there is the history of a mild or severe strain, the pain may be simply an ache, occurring in the lower back, or it may be so severe as to wholly incapacitate the patient. The pain is so great at times that any motion causes pain. Pain is usually indicated at the sacroiliac joint, over the centre of the sacrum, or at the base of the ribs. It may be referred to the crest of the ilium, to the front of the pelvis or down the thigh, even to the calf and the heel, according to the position of the nerve involved. Examination reveals some tenderness in the region of the sacroiliac joint, shown in many cases by deep pressure just below and to the side of the umbilicus. There is limitation in forward bending and side bending toward the opposite joint.

In the chronic type you are more apt to find the flat back and lateral deviation of the spine away from the lesion; if bilateral there is no deviation, contraction of the lumbar muscles, spasm of the muscles and the pain more often referred along the sciatic nerve. The pain is usually present at all times and is usually mild in character but subject to exacerbations at each new trauma. At times undue mobility may be elicited over the sacroiliac joints, especially in very relaxed individuals.

The static or hollow back variety onset is gradual. As a rule, there is no history of trauma. You have a picture of round shoulders, hollow back and protuberant abdomen, seen generally in girls from four years of age to twenty. The pain is not acute, is more of a backache, and there may be slight tenderness of the sacroiliac joints.

In the toxic groups the pain is usually gradual in appearance and is secondary to toxæmia or inflammation in other parts of the body. The condition is aggravated by standing, sitting or walking; any jar causes pain which is present at all times, but is paroxysmal in character, and is referred over back, pelvis, hips and down the legs. There is marked rigidity of the back and hip. There is marked tenderness, muscle spasm, and examination, as a rule, shows tenderness just to the outer side of the erector spinæ muscles.

Treatment.—Mild cases, traumatic type, are treated by adhesive strapping, which relieves symptoms as long as the strapping is taut. In severe cases rest in bed with hips supported by a pillow under the loin and two pillows under the knees and adhesive strapping will afford relief. In the chronic type with flat back and contracted posterior muscles and adhesions, a pelvic corset on men, or a straight front corset with back brace on women, may be tried.

In the more severe cases in which simple measures fail, manipulation is indicated as it relieves muscle pain and also corrects the flat back. The manipulation is done with the patient on his back by means of flexion of the extended limb over the abdomen until the foot, at times, almost touches the chest. It must be done under ether, and until the muscles are absolutely relaxed. A long plaster cast is then applied from the nipple taking in one knee. It is worn from two to six weeks, and after removal a proper support must be worn. This is gradually discarded.

The toxic group are the most trying of all cases and the causes of most failures. Every source of infection must be sought or failure will result in spite of all local treatment.

TRAUMATIC HERNIA AND THE WORKMEN'S COMPENSATION BOARDS

Hernias are classified as follows by the Conference Board of Physicians in Industrial Practice: (1) External ring admits tip of little finger, impulse felt; (2) external ring admits thumb, protrusion; (3) external ring patulous, bubonocele; (4) mass reaches

external ring level; (5) mass scrotal. Patterson (*Pa. M. J.,* 1919, xxii, 633) is convinced that 10 per cent. of all men applying for employment are in classes 3, 4 and 5, and that another 50 per cent. are in class 1 or class 2. He discusses the cases wherein the hernia is alleged to have followed a slip, a strain, a misstep, a fall, a squeezing, a blow, or to have simply occurred while the individual was at his usual occupation. In questioning we find that the usual history is that the patient did not notice the hernia at the time that it was alleged to have occurred, and possibly not until some hours or days later, when taking a bath. They will further state that there was no pain at the time of the alleged accident, nor was there vomiting, prostration or shock, and in many cases there has been no time lost from the time of the alleged acquiring of the hernia until the patient presents himself for examination for his claim. When a case of this type is examined we find usually a well-developed hernia, frequently the sac within the scrotum. The hernia is usually easily reducible without pain, and further examination will show a large patulous ring.

The attitude of the Compensation Boards of many states is reviewed, which leads the writer to the conclusion that there is a strong feeling among employers of labor that they are bearing the cost of, and therefore being penalized for, a congenital defect in certain of their employees. The awards of the Conpensation Boards throughout the country would seem to justify this feeling. The solution of the present situation may be met by the following proposed amendment to the Compensation Law of Pennsylvania and every other state:

" Hernia is a disease which ordinarily develops gradually, being very rarely the result of an accident.

" Where there is real traumatic hernia resulting from the application of force directly to the abdominal wall, either puncturing or tearing the wall, compensation will be allowed. All other cases will be considered as either congenital or of slow development and not compensable, being a disease rather than an accidental injury, unless conclusive proof is offered that the hernia was immediately caused by such sudden effort or severe strain that, first, the descent of the hernia immediately followed the cause; second, that there was severe pain in the hernial region; third, that there was such prostration

that the employee was compelled to cease work immediately; fourth, that the above symptoms were of such severity that the same were noticed by the claimant and communicated to the employer within twenty-four hours after the occurrence of the hernia; fifth, that there was such physical distress that the attendance of a licensed physician was required within twenty-four hours after the occurrence of the hernia. In the case of hernia, as above defined, compensation will be paid until such time as the employee is able to resume some kind of work with the aid of a truss or other mechanical appliance. If the employee refuses to permit of an operation, the employer shall meet the requirements above specified, pay the reasonable costs of the truss or other appliance found necessary and also pay compensation not to exceed twenty weeks, following which his obligation shall cease and terminate, unless death results from the hernia, in which case the compensation shall be paid. However, if the employee shall elect to undergo an operation by a physician selected by the employer, the employer shall meet all the expense incident to such operation and recovery, not in excess of one hundred and fifty dollars, together with compensation as provided during the periods of disability prior to and following the operation, as provided in the Act. If the employee refuses the services of the physician selected by the employer, prefer-ring one of his own selection, the employer shall be relieved of obligations concerning medical expense due to the operation and re-covery, but shall pay compensation during the prior and resulting periods of disability, except as provided in the Act. If death results from the hernia or operation, compensation shall be paid to the de-pendents in accordance with the terms of this Act.

"Where it is proven to the satisfaction of the Compensation Board or court that a well-formed hernia sac or other proofs of a long-standing hernia were found at the time of the operation for radical cure, a claim for compensation for hernia shall be disallowed."

TREATMENT OF BURNS

The experience gained by simultaneously treating 32 cases of severe, extensive, multiple burns of varying degree, and comparing the value of well-known methods of treatment, led Fauntleroy and Hoagland (*Annals of Surgery*, 1919, lxix, 589) to the following valu-

able conclusions: The need for the quick institution of immediate general supportive measures in patients suffering from extensive burns. The value of fluids in large quantities by mouth and bowel, even before the so-called toxæmia or acidosis symptoms commence to appear. Later, during the absorption period, from large infected areas, the addition of the continuous use of small doses of morphine sulphate seemed to be of distinct advantage. It certainly serves to keep the patient quiet and thereby preserves his energy for later use. Too much stress cannot be laid on the value of these general measures, used as a prophylactic procedure, immediately following injury, before the advent of those well-known toxic symptoms, which are sure to follow in one extensively burned. They are far more important than any value obtained by laying too much stress upon the burned area during this initial period. It was again proved: That patients extensively burned quickly go into a severe shock the first twelve hours. That reaction from this period may be followed by an equally fatal period on or about the fourth or fifth day. That recovery from this secondary period is later followed about the fourth or fifth week by a period in which the element of exhaustion is a very important consideration.

The local procedures demonstrated the following: Initial antiseptic cleansing. Alcohol, boric acid solution, salt solution, Dakin's, Wright's solutions, all proving equally efficacious. Gentle dressing manipulation during this period with traumatism reduced to a minimum. As soon as possible, the application of a single protectant, paraffin, ointment, gutta-percha or rubber strips.

The local measures again proved: That no one procedure, wet or dry dressing, wax, ointment, or that no one solution proves equally valuable in all cases. That the individual question of how the particular area reacts to the solution used is an important one. That there is a distinct difference between the mild stimulation and healing effect of bland protectants, such as wax, liquid petrolatum and vaseline. That the so-called "switching time" in the application of these various dressings is a distinctly important one. That some patients cannot tolerate open-air exposure. That the absolute non-interference and non-removal of semiadherent tags of skin is usually the best procedure.

TREATMENT OF FRACTURES

Many of the lessons learned during the war in the treatment of fractures are being applied to the management of fractures occurring in civil life, and it is safe to say that many of the methods in use for years will be supplanted by the more modern ones evolved from the experience gained in handling large series of cases in military practice.

The principles of suspension and traction by counterweight and weights acting by means of pulleys are summarized by Blake (*J. A. M. A.,* 1919, lxxiii, 748).

In every fracture of a long bone the proximal fragment tends to occupy a certain position, which is determined by the muscles attached to the fragment. The forces produced by these muscles may be termed intrinsic. This position, which may be designated as the position of election or rest, is readily modified up to certain limits by any slight extrinsic force; that is, one operating from without. Conversely, if a slight restraint is supplied, considerable motion at the proximal articulation may occur without there being any change in the absolute position occupied by the fragment. Traction on the distal fragment not only prevents overriding and shortening, but when applied in the direction of the axis of the proximal fragment, when in the position of election or rest, also tends to prevent harmful angulation at the site of the fracture as a consequence of the restraining action of the sheath of the stretched muscles about the proximal fragments.

Proper counterbalanced suspension, by allowing the limb to follow the body, permits a considerable latitude of movement of the latter in bed without deranging the relative position of the fragments. Traction in order to accommodate itself to the position of the patient (unless the traction is contained within the splint) must be made by a weight and cord running on a pulley, and the pulley should be as far as possible from the point at which traction is made, so as not to limit the swinging of the limb. The lack of fixation in permitting a certain amount of motion between the fragments does not delay union; on the contrary, consolidation appears to be more rapid, probably because of better nutrition. With traction and suspension properly

applied, it is possible to move all of the joints of the fractured limb throughout the treatment, no matter which bone is fractured.

The principles of the treatment are: to avoid actual fixation; to employ traction to its fullest possibilities in overcoming deformity, and to use suspension so as to afford the greatest freedom of movement, both of the trunk and of the joints. The chief and underlying principle is conservation of function.

When possible, in all fractures of the femur, skeletal traction, preferably with Ransohoff's tongs, is made directly on the lower fragment, and in some cases of fracture of the lower one-third, the tongs may be used to lift the distal fragment into position by elevating the axis of traction.

The Thomas is the most useful and practical of all splints for fracture of the thigh and leg; in some cases the half ring modification or the Hodgen splint is preferable.

Groves, in treating fractures of the femur (*J. A. M. A.*, 1919, lxxiii, 742), prefers transfixation of the tibial crest and goes through nothing but skin, fascia and bone; it needs only a one-eighth-inch pin; it concerns very dense bone; it can be left in place for four months, and if sepsis occurs from its seton action, it can, as a last resort, be cured by a V-shaped incision of the crest of the tibia in front of the transfixation points.

In bone-grafting operations Groves believes certain mechanical factors have been neglected, namely, extensive accurate contact of the graft to its bed; efficient fixation and correction of the deformity. It is necessary to make a clear cut of the fragmented or withered ends of the broken bone and this should be done, not according to rule and measure, but until the cut surface bleeds well. The graft cut from the anterior surface of the tibia should be approximately of the same thickness as the bone which it is to replace, as wound repair is facilitated by an even contact of level surfaces.

Wheeler (*British Medical Journal*, 1919, February 1, 119) concludes from his experience that whatever the histological rôle the clinical usefulness of the bone graft is not affected. The final success of bone grafting in cases in which a gap is bridged depends upon the operation of Wolff's law, the graft stimulated by strains and stresses, changes its internal architecture and external conformation

until the required strength is attained. The periosteum should be left in the graft, because although not essential, it is the medium through which new blood-vessels enter the graft and the surrounding structures, and a periosteum-covered graft is less likely to become rapidly absorbed. To provide the necessary strains and stresses it is advisable to allow the graft to functionate as early as possible; in most cases preliminary fixation for three months is essential.

In old ununited fractures the bone near the site of fracture is sclerosed and avascular and makes an unsuitable soil for that portion of the graft in contact with this area. The graft may become attenuated and absorbed or break five or six months after operation. In the same class of cases very prolonged fixation is unfavorable to osteogenesis, to the establishment of blood supply and bone union. Early movements may lead to yielding of the graft and failure. The problem may be solved by wide resection of the bone and resignation on the part of the patient to a short limb. But for slightly slower osteogenetic powers and a real tendency to fracture, the intramedullary peg is effective. This method of bone grafting is satisfactory in the case of the radius and the ulna. In the case of the humerus and femur, long, stout inlay grafts give the best results. Sliding grafts should only be employed in simple and fresh cases.

Mauclaire (*Bulletin de l'Acad. de Med.*, 1919, lxxxi, 126) has collected 128 cases of bone-grafting operations in war wounds, of which 72 are reported as successful. In the majority of cases an autograft was employed to bridge the defect in a long bone, and an interval of several months should be allowed after the wound is healed; if suppuration is present at least six months should lapse before a bone-grafting operation can be considered.

Excellent results have been obtained by the methods of nail extension in the experience of Fresson and Toupet (*Rev. de Chirurgie,* Paris, 1919, xxxvii, 161) who report 32 cases, 26 of which were compound. Healing of the fracture was prompt, and perfect functional result obtained in 18. Among the advantages of nail extension is the important one of permitting exercise of the knee. The extension is maintained for an average time of six weeks, and the nail is generally well tolerated by the tissues. In one instance only was there an indication of a complication, hydrarthrosis developing.

BONE TUMORS

The destruction of the bony shell of a giant cell tumor (sarcoma) led Bloodgood (*Annals of Surgery*, 1919, lxix, 345) to reinvestigate 47 cases of this type in order to determine if complete destruction of the shell or its perforation at one or more spots with infiltration of the tumor tissue, led to any increase in malignancy. The results showed that there was no increase in the degree of malignancy, and in the series no deaths from metastasis.

The giant-cell tumors arise most frequently in the lower end of the femur, the upper end of the tibia, and the lower end of the radius, portions of bones of the skeleton subjected to the greatest trauma.

Recurrence after curetting for giant-cell tumor may be explained by the neglect of cleansing the bony shell with some agent which will destroy remains of tumor tissue. For this purpose carbolic acid is suitable. The fact that many giant-cell tumors have remained well after curetting and even after a second or third curetting is strong evidence of benignity or a very low grade of malignancy.

When the X-ray shows bony destruction or when at operation the surgeon finds perforation of the capsule, the operator will be inclined to do a more extensive operation, either an amputation or a more extensive resection, which might interfere with the function of the limb.

The giant-cell tumor always looks vascular, resembling œdematous granulation tissue, but it is much more friable. When curetted from the bony shell, all operators have noted the great hemorrhage from vessels perforating the bony shell. In spite of this great vascularity, hemorrhage into the tumor occurs rarely.

The periosteal and central sarcomas of bone and sarcoma of the soft parts and glands metastasize, death results from lung involvement and no local recurrence takes place. In many instances the local growths of the sarcoma which has caused death by metastasis has been just as circumscribed and, in some instances, more circumscribed than the local growth of the giant-cell tumor. The size of the local growth which produced death by metastasis is not necessarily large. It is, therefore, of the utmost importance, especially in relation to bone tumors, to be able to recognize the giant-cell tumor, because

when it is recognized a cure should be accomplished with little or no mutilation beyond that due to the destruction of the tumor itself.

Surgeons and pathologists should learn to recognize the central giant-cell tumor at the exploratory incision, and when it is recognized and its benignity accepted there undoubtedly will be more cases subjected to curetting, and resection will only be done when made necessary by the complete absence of bony shell or when resection will leave the limb with equally good function.

Coley in his most recent paper (*Annals of Surgery*, 1919, lxx, 633) emphasizes the importance of conservative measures and certain points in the treatment of bone tumors. He has found that pain of a deep boring character, steadily increasing in severity, is often one of the earliest and most important signs of sarcoma of the long bones. Many of the patients are first treated for some rheumatic condition, until the disease has progressed sufficiently to produce a palpable tumor. Persistent pain is often present for weeks or months before there is a palpable tumor or the X-ray discloses any evidence of a new growth. Pain is a more important symptom in periosteal growths than in the central tumors. The latter often attain considerable size with little or no pain.

In the cases in which there is a reasonable doubt of the diagnosis, the advantage of an exploratory operation greatly outweigh the disadvantages. If the tumor is a periosteal sarcoma, it is extremely important to make the earliest possible diagnosis. In the great majority of cases, the clinical signs confirmed by X-ray render the diagnosis practically certain. If the disease is far advanced, there will be no doubt.

Coley believes in many instances it is difficult to determine whether a case in question is a giant-cell tumor of benign type, or an actual sarcoma with malignant features. Of 40 cases of giant-cell tumor, eight died of metastasis, showing that the tumors were of a different type from those described by Bloodgood, which growth he regards as being rare.

In dealing with periosteal tumors there is no doubt as to the malignancy of the growth, and all agree that even the most radical operation rarely saves the life of the patient. The hopelessness of the condition warrants us in trying almost any method of treatment, and justifies exploratory operation in order to establish the diag-

nosis at the earliest moment. Formerly amputation was advised in these advanced cases, until it was found in some instances in which operation was refused that the limb and the life of the patient was saved by the use of the mixed toxins. Such results, Coley believes, justifies us in treating even periosteal sarcomas by conservative methods; that is, combined treatment by the systemic effect of the toxins with the local action of radium. If the tumor does not show marked improvement in the course of four or five weeks under this treatment, amputation is then indicated, and the toxins given as a prophylactic against recurrence.

It is difficult to estimate the definite percentage of cases in which one may succeed in saving life and limb in sarcoma of the long bones. It depends largely upon the stage of the disease at the time conservative treatment is begun; the percentage will be much higher in the cases treated at an early stage than in those treated at a later stage.

AMPUTATIONS

The resurrection of the guillotine method of amputation is regarded by Gibbon (*Annals of Surgery,* 1919, July, 111) as important because of the frequency of secondary hemorrhages, the slow healing extending over months, the painful dressings and the secondary operations which are necessary in nearly all of such amputations. In many instances, in war injuries, ligation of the common femoral was necessary on account of the repeated hemorrhages.

The application of appliances to draw down the skin, which had already, in most instances, become fixed at the edges, was a painful and troublesome procedure and too often did not succeed sufficiently to obviate the performance of a secondary amputation or a plastic operation. A sufficient number of cases were observed in which a skin flap was made and reflected to an extent that fully exposed the divided muscles and where healing was fairly prompt and a good conical stump formed to prove that the guillotine amputation has no place, or a very limited place, in war surgery. The making and reflection of the flaps occupied but a few minutes and cannot greatly increase the shock. A circular suture passed around the ligated stump of a vessel buries it sufficiently to insure against early hemorrhage. If the flaps are properly reflected, the wound is as wide open

as in the guillotine amputation. Finally, the reflected skin flap amputation gives exactly the same type of stump, but gives it earlier, with less suffering and less danger, and therefore would appear to be the method of choice in civil practice.

JOINT SURGERY

The treatment of joint injuries by immediate and active mobilization started with the aspiration of traumatic effusion of the knee, followed by making the patient walk at once. This experience then led Willems (*S. G. O.,* 1919, xxviii, 546) to adopt similar active measures in joint injuries sustained in war. In the simplest and most severe conditions, immediate active mobilization was used after operations for penetrating joint wounds with or without an included projectile and for all varieties of intra-articular war fractures. In the treatment of purulent arthritis the method has been followed by the most astonishing success. In simple lesions immediate active mobilization obviates atrophy and ankylosis. In purulent arthritis it seeks, on the contrary, to drain the articulations. In the first case the joint must be completely closed; in the second it must be widely open.

The mobilization must be active; that is, made by the patient himself, by muscular contractions. The movements ought to reproduce the essential normal movements, extension, flexion and rotation.

Mobilization must be commenced as soon as the patient awakens from anæsthesia. The patient must not be permitted to rest. The movements must be pushed to the maximum in every direction and must be kept up uninterruptedly. The treatment requires from the patient an effort, which he will make only if he is kept at it all the time.

In the case of purulent arthritis, arthrotomy followed by active mobilization provides drainage without a tube and without irrigation. Willems believes irrigations are more harmful than useful.

The method can be used in cases in which purulent arthritis accompanies an intra-articular fracture, on condition that there is no fear of displacing the fragments. If there is, movements are contraindicated because they might dislocate the joint. The method is also applicable if primary destruction of the ligaments and of the

articular capsule is present; partial destruction, however, does not render the method altogether inapplicable.

This form of treatment has been termed the physiologic method by Everidge (*Brit. Jr. Surg.*, 1919, vii, 566), who emphasizes the necessity for adequate openings into the joint in infected cases to permit the escape of pus; otherwise, the joint movements will disseminate infected material into the *cul de sacs* of the joint and extra-articular tissues. In about 50 per cent. of the cases so treated a useful mobile joint has been obtained.

A general idea of the revolution which has taken place in joint surgery during the war is seen by Duval's (*S. G. O.*, 1919, xxix, 222) statistics. During 1915 war wounds of the knee were treated in the lines by arthrotomy and drainage and with a mortality of 27.5 per cent. Amputation of the thigh was done in 30 per cent. of the cases. During 1916, 1917 and 1918 war wounds of the knee were treated in the lines by total suture and express preservation. In 130 cases there were 21 immediate resections with 4 deaths. Resection was not done in 104 cases. There were 86.5 per cent. complete cures, 9.6 per cent. comparative failures, 2.8 per cent. amputations, 0.9 per cent. deaths.

The causes of poor results in knee-joint injuries obtained in American hospitals is ascribed by McWilliams and Hetzel (*Annals of Surgery*, 1919, lxx, 257) to (1) incomplete knowledge of the Willems treatment or fear of possible experimentation; (2) an insufficient supply of nurses to carry out, systematically, the motions; (3) too early evacuation of the patients. They urge that the method of active mobilization should be taught in our medical schools, so that it will supplant the old mobilization dogma which should be discarded, except in cases where fragments would be dislocated by the motions.

Pool and Jopson (*Annals of Surgery*, 1919, lxx, 266) are of the opinion that a conservative policy in dealing with wounds of the knee-joint caused by projectiles is justifiable and strongly indicated, whether it be viewed from the standpoint of mortality, preservation of limb or maintenance of functions. This policy has shown that infection can be avoided in a great majority of the cases; that even when intra-articular infection develops function can sometimes be preserved, or, if lost, that amputation is not inevitable.

NERVE INJURIES

Adson (*Annals of Surgery,* 1919, lxx, 157) has studied 41 cases of nerve anastomosis, the average duration of the injury being fifteen months. Seven cases were associated with fractures, one with a dislocation and 33 with lacerated wounds. Eighty and five-tenths per cent. of the operations were nerve anastomoses; the balance were plastic operations of some sort. Sixty-five per cent. of the anastomoses were sutured with silk, 29 per cent. with catgut. Fascia alone or with silk and chromic catgut in the form of a tube was used to protect the anastomosis in 49 per cent., silk was used in 10 per cent., and in 10 per cent. there was no covering. The average time before improvement was noticed was nine and nine-tenths months, and the average time to reach maximum improvement was twenty-one and five-tenths months. The average amount of improvement obtained was 58 per cent. return of the sensory, 62 per cent. of the motor, and 67 per cent. return of the trophic function. Improvement was obtained in 73.1 per cent. of all operations, 17 per cent. were total failures, and 9.7 per cent. gave indefinite results.

The degree of regeneration depends on (*a*) duration of time between injury and repair, the shorter the period the greater the regeneration; the possibility of regeneration is very slight after three or four years; (*b*) actual loss of nerve tissue, and (*c*) contraction of severed ends.

In the technic of nerve repair (*a*) no covering is necessary if the freshened ends can be sutured in close approximation; (*b*) if an interventing gap remains, it should be tubulized, preferably by fascia; (*c*) if the gap is larger than 5 cm., tendon transplantation and arthodesis should be considered instead of nerve anastomosis; (*d*) autogenous transplants may be considered for short gaps, but they are of no greater value than tubulization; (*e*) in all technic, the wound should be free from hemorrhage and infection and the nerve ends should not be traumatized; and (*f*) during the postoperative convalescence the paralyzed muscles should be massaged and passive motion should be administered.

WOUNDS OF THE CHEST

It is generally admitted that perforating wounds of the chest are best treated by expectant measures. In perforating wounds caused

by fragments of high-explosive shells, infection is apt to be carried
into the pleural cavity, and the associated hemorrhage, which gen-
erally complicates this type of injury, materially increases the likeli-
hood of infection. Eliot (*Annals of Surgery,* 1919, lxx, 30) reports
a series of cases complicated by hemorrhage, in which either aspira-
tion or thoracotomy was required. Penetrating wounds include those
with the lodgment of a foreign body in the pleural cavity and those
complicated by the retention of fragments in the lung itself. If the
projectile is impacted in the pleural opening and can be reached in
the course of the debridement of the external wound, its removal
is preferable.

The removal of foreign bodies that have already reached a portion
of the pleural cavity remote from the wound of entrance should be
attempted only in case they cause undue irritation or lead to infec-
tion. Their successful removal usually requires extensive exposure,
and may lead to infection of the entire pleural cavity.

The most frequent group of penetrating wounds of the chest
include those in which the projectile has lodged in the lung tissue.
Immediate removal is unquestionably associated with a much higher
mortality than allowing it to remain undisturbed. Conservative
treatment affords opportunity for almost complete restoration of
vitality, and if the development of infection or, later on, the continued
irritation of the foreign body justifies operation, it may be done under
much more favorable conditions and with much greater chance
of success.

Immediate infection seems to be uncommon, and is unlikely to de-
velop in patients who remain free from such infection for a period
of ten days after the injury. Whether infection will subsequently
occur in the pulmonary tissue adjacent to and inclosing the pro-
jectile can only remain a matter for conjecture, although it seems
reasonable to infer that, as a general rule, fragments of high-explosive
shells, many of which originally carried agents of infection, will
remain in the lung quiescent indefinitely.

Intrathoracic projectiles should be removed, according to Le
Conte (*Annals of Surgery,* 1919, lxx, 37), when the patient com-
plains of pleurodynia, shortness of breath on slight exertion, cough
or dyspnœa, more or less frequent hæmoptysis, and when there are
signs of congestion in the lung surrounding the projectile, with slight

elevations of temperature. When the projectile lies in the mediastinum or hilum of the lung, its size and the degree of tolerance must be carefully balanced with the danger of its removal. In the average case the intervention is so simple, the extraction so easy, the recovery so prompt and the risk so small that due weight must be given to these things when the subject of operation is under discussion. The method of Petit de la Villion, which is fully described, is recommended because it is by far the easiest and most rapid way of extracting a foreign body from the lungs; it is the most certain and direct way of reaching the projectile; it is free from operative shock; it traumatizes the least possible amount of tissue; it reduces postoperative sequelæ to a minimum; the recovery is rapid and the mortality low.

Lebowitz and Nadler (*S. G. O.*, 1919, xxix, 429) report 174 penetrating wounds of the chest, observed during an intermediate stage; that is, on the average, from the sixth to the thirteenth day after injury. They conclude from their study that the mortality of such cases reaching the base was low (5.4 per cent.), due chiefly to sepsis, pocketed empyema and associated injuries. These patients require treatment in special wards. Coöperation of internist, pathologist, röntgenologist and surgeon is essential. Hæmothorax is the commonest event in chest wounds. Early diagnosis of infection is the most important duty at the base. Thoracotomy for infected hæmothorax is the most frequent surgical procedure at the base hospital. Carrel-Dakin treatment for empyema gives good results. Primary intrathoracic operations with closure may be performed early after injury in properly selected cases with no more danger than abdominal operations. Of 21 cases operated upon and closed, 9 remained sterile. It would seem that this type of case, in particular, should be retained for a longer period than was customary to insure safety and comfort in travel.

PULMONARY SUPPURATION

Under this comprehensive term Hedblom (*Med. Record,* 1919, cxvi, 441) includes abscess, gangrene, bronchiectasis and purulent bronchitis. Gangrene is largely a pathological distinction. Typical cases of massive gangrene may be recognizable clinically, but all intermediate gradations of abscess and gangrene occur. Each may super-

vene on the other. When we diagnose gangrene and when we get it for treatment, it is almost always accompanied by suppuration; it is abscess and gangrene.

As the result of an exhaustive study of the condition, the writer believes pulmonary suppuration is really more frequent than is generally recognized. Suppuration occurs on a preceding inflammatory basis, or the infection is carried to the lung tissue through the bronchus, the blood-stream or by direct extension. A persistent productive cough is the most characteristic symptom. The sputum is usually purulent and often foul. Other clinical features of suppuration are present in varying frequency and degree. Localized dulness to percussion and a circumscribed X-ray shadow are the most constant physical findings.

Pulmonary suppuration is probably frequently mistaken for phthisis. In 33 per cent. of the cases reported by the writer, symptoms were suggestive of tuberculosis. Suppuration and a tuberculous infection may co-exist without anatomic or etiologic relationship. The differential diagnosis between localized bronchiectasis and abscess may be impossible; each predisposes to the other.

The treatment of localized suppuration is early free drainage. Prolonged expectant treatment or inefficient drainage greatly increases postoperative morbidity and mortality. Local and regional anæsthesia is safe and in most cases very satisfactory. The abscess should be drained only through the adherent pleura or after the pleural cavity has been walled off by suture of the lung to the parietal pleura. A two-stage operation, allowing a few days for adhesions to form around the suture line, probably is the best safeguard against empyema, which is a frequent and the most dangerous complication.

In Green's (*Annals of Surgery,* 1919, lxx, 539) experience there has been reluctance in the minds of medical men in making a clearcut diagnosis of a lung abscess. The diagnosis of the condition, if acute, may be based upon certain factors, a prominent one of which is a fresh rise of·temperature. After recession of the temperature come symptoms of increased cough and sputum and a changing shadow, as shown by consecutive X-rays. The history is that it follows either the inhalation of a foreign body or a pneumonia. The pathology is that of a lung cavity on one side or the other, or possibly on both sides. The physical signs are those of localized consolidation

with occasional cavernous breathing and bubbling râles. Clubbing
of the fingers is a constant feature. The expectoration is profuse,
of a sweetish fœtid odor, rather free from tenacious mucus, and of a
greenish-yellow color. The treatment is chiefly surgical and consists
in removal of a rib or ribs with drainage of the abscess through an
adherent area of the viscera to the parietal pleura. There are certain
lung abscesses with thickened walls, which may require more exten-
sive surgical treatment. These will probably not be cured by simple
draining. They may necessitate the resection of a lobe of the lung.
The procedure for draining the lung abscess may be a one, two or
more stage operation. The first stage may be used as an index of the
patient's power of resistance. If operative treatment is refused or
seems unjustifiable, postural treatment may sometimes effect a marked
amelioration of the symptoms.

EMPYEMA

For purposes of study, streptococcic empyema must be divided
into three stages, the formative, acute and chronic. Moschcowitz
(*S. G. O.,* 1919, xxviii, 337) states that the most striking feature
of the formative stage is the extremely rapid formation of the pleural
exudate. The treatment of cases in this stage should be supportive
and operations should not be performed. When the fluid causes a
serious embarrassment of respiration and circulation, as evidenced by
dyspnœa, cyanosis and rapid pulse, it should be relieved by aspiration
and repeated as often as is necessary. In rare cases this procedure
may be curative. Prompt operation is indicated only in the cases of
acute and progressive hydro- or pyopneumothorax which result from
the rupture of a large subpleural pulmonary abscess, communicating
with a bronchus. By waiting, the pre-existing free seropurulent
pleurisy is converted into a closed purulent pleurisy or empyema, shut
in everywhere by limiting adhesions, and thus we arrive at the
second stage.

When the acute stage is reached the general condition of the
patient has improved remarkably, and this is the most propitious time
for operation. All operations should be preceded by a final X-ray to
determine the most favorable site for operation. The operation
should and can be carried out under local anæsthesia. The writer is
in favor of simple intercostal incision, because it takes little time,

and especially because the drainage opening is just as ample as after rib resection. This procedure is seldom followed by necrosis of the ends of the divided rib, a common cause of persistent sinuses. Drainage is made through a single large-size rubber tube of rather stiff quality and about one foot long. The tube is forced through a tiny perforation in a piece of rubber dam, about four inches square, which is fixed to the tube with a thread at a distance of from two and a half to four inches from its thoracic end. Near the thoracic end one large fenestra is cut into the tube. When introduced into the thorax, the fenestra is just inside, and the rubber dam is flush with the skin. No sutures are ever employed and the external wound packed with gauze.

A simple combination instillation and suction apparatus is attached to the drainage tube, and once an hour or more or less frequently, as indicated, the syphon part of the apparatus is clamped, and the requisite amount of Dakin's solution allowed to drain in and the suction started again in five minutes.

This combination apparatus is advantageous, as all the discharges are collected into the receiving bottle, and in consequence the wound does not require any change of dressing for one week to ten days. The cavity is perfectly dry; there being no retention of pus, fever does not arise. An easy opportunity is given to permit a prompt and efficient use of Dakin solution. The vacuum created aids to a limited extent in the expansion of the lung.

In the after treatment, all rules, as enumerated by Carrel for the preservation of a perfect asepsis, are rigidly adhered to. Cases complicated by pleuropulmonary fistula, particularly if of large size, cannot be injected with large amounts of Dakin's solution because of the very irritating cough which results from overdistention of the cavity; they tolerate, however, hourly instillations of the requisite amount.

Smears and cultures are made twice a week from the cavity and when sterility is reached all tubes are left out and the Carrel-Dakin treatment is discontinued. Prompt and permanent healing is the result in many instances.

In regard to the use of antiseptic solutions, Eggers (*S. G. O.,* 1919, xxvii, 348) states that it is impossible to say truthfully that one method yielded uniformly good results; any very striking results showing marked superiority over other methods were not observed.

In reviewing the results of empyema operations, Rodman (*Annals of Surgery,* 1919, lxx, 49) found the mortality in cases treated by early operation of rib resection to be 45 per cent. This fell to 28 per cent. when repeated aspirations, late operation and thoracotomy with rib resection was performed. In the final series, aspiration, late operation, rib resection, usually under light chloroform anæsthesia, irrigation with Dakin's solution and sitting up exercises gave a mortality of 10 per cent. The average period of convalescence was five to six weeks in the last series of 133 cases.

It should be borne in mind that the results published by surgeons who had a large experience in the treatment of empyema in the base hospitals during the influenza epidemic of 1918, concerned a peculiar type of infection producing lesions differing in many respects from those encountered in empyema as generally seen after pneumonia. Hartwell's (*Annals of Surgery,* 1919, lxx, 55) advice, therefore, seems particularly timely, as many are apt to be led astray by the result of the methods adopted to meet the situation of that period. Hartwell calls attention to the fact that if the experiences of the past two years are made the basis of the standard treatment of empyema, under conditions of pulmonary disease less abnormal than those existing during this trial, a distinct step backward will have been taken. The history of empyema during the past five decades shows that from time to time there have arisen advocates of the so-called less radical forms of treatment, who have enjoyed a short period of success. Failure always succeeded this period. Therefore, no form of treatment for empyema which disregards the thorough drainage of the chest cavity by a rib resection, and the gradual re-expansion of the lung by respiratory effort, meets the requirements. Other means will cure a certain number of cases, particularly in such times as the disease occurs in abortive forms, which it has done during the past two years.

HÆMATOGENOUS INFECTION OF THE KIDNEY

Fundamentally, Bright divided kidney lesions into two types: Type 1, the acute or " wet " nephritis, and Type 2, the chronic or " dry " nephritis. Mayo (*J. A. M. A.,* 1919, lxiii, 1023) classifies as Type 3, nephritis the result of living organism. True nephritis is concerned with the filter portions of the kidney, and failure to filter out

all the bacteria and their retention is responsible for the occurrence of one form of the disease, which is of great surgical importance. Accepting the idea that there is a common form of true nephritis, which differs from Types 1 and 2 and is caused by a bacterial infection, we quickly see that the effect on the kidney will depend on the nature of the bacteria, their number and on the condition of the kidney itself, or whether, for example, there is an anomaly present, such as hydronephrosis or calculi, which makes the kidney more vulnerable. Pyogenic infections may lead to cortical abscesses and other evidences visible to the eye, but with scanty urinary findings beyond a trace of albumin in the acute stage, and a few microscopic pus and blood cells, the urinary evidences are so slight as to be overlooked unless great care is exercised. In the subacute and chronic forms the kidney may be more or less destroyed, and the common forms of pyonephrosis will follow. The pyogenic cocci are short-lived and often are not to be found in the pathologic changes their action initiates. On the contrary, colon bacteria, by the production of copious, purulent sediment in the urine, give abundant evidence of infection without abscess formation in the kidney.

Hæmatogenous nephritis is often caused by cocci found in the skin, especially staphylococci derived from boils, carbuncles, etc., and from focal infections generally. The staphylococcus is short-lived and often affects only one kidney. Acute streptococcal infections are most malignant. Subacute and chronic streptococcal infections occur commonly as a result of septic endocarditis and appear in the kidney as a terminal infection, embolic in character.

In the fulminating type of hæmatogenous pyogenic infection, unless nephrectomy is performed, death may result within a few days. The acute condition is often confused with acute intraperitoneal infection. In the subacute and chronic forms, natural processes may localize and sterilize the foci of infection and the patient may fully recover, or partial recovery may later be followed by chronic infection, and the kidney will be converted into a pyonephrosis.

THE TREATMENT OF MYOMA UTERI WITH RADIUM

Within certain limitations, we may, with positive assurance, assume that, from the standpoint of efficiency, safety and morbidity, this remedy must supplant surgical intervention in these tumors and

for the relief of intractable myopathic hemorrhages.   Beyond these limitations, Clark (*J. A. M. A.,* 1919, lxxiii, 957) is also convinced that surgery still has a dominant place in the treatment of properly selected cases.

These essentials are capital in the use of radium: first, an accurate diagnosis in all cases; second, the proper selection of cases; and, third, the careful gradation of dosage, beginning when young women are being treated, with a minimum application and increasing the duration of application slightly, if the first attempt fails to check the excessive flow.

In women, within the menopausal years, certain facts are noted. The tumor must be uncomplicated with coincidental inflammatory disease; it must be causing hemorrhage, and it should not be too large. Pain, when present, even without coincident evidences of inflammatory disturbance, is seldom relieved, even though the tumor largely disappears; and in other instances in which there was an old salpingitis, a flare-up of a quiescent process has occurred.   Therefore, the rule has been established that no patient suffering with pain lateral to the uterus is to be radiated.

Radium has been used seldom in a tumor larger than the size of a five months' pregnancy, and then only under very exceptional circumstances, such as in the presence of grave cardiac or renal complication or serious constitutional defects, which plainly rendered any operation too dangerous.   Generally this treatment is confined to cases in which the tumors are the size of a three months' pregnancy or smaller.

In many instances, after radiation, patients have passed through atypical climacterium, and the periods have returned and have then resumed a normal menstrual physiology.   This phenomenon has been sufficiently frequent to lead to the belief that the radioactivity of the usual dosage is expended chiefly within the uterus and not in the ovaries.

RADIUM IN CANCER OF THE SKIN

Radium is particularly valuable in the treatment of skin cancer arising about the orbit, according to Simmons (*Boston M. and S. Jr.,* 1919, clxxxi, 477).   Less deformity of the lids results by the destruction of the growth in this manner than by operation, which can be

performed later if the radium treatment is unsuccessful. In carcinoma of the foregoing region, as well as on the nose and parts of the cheek, the final cosmetic results following radium treatment are better than those following operation. On the other hand, in some cases, especially where the growth is situated about the ear or on the cheek, operation, followed by a plastic flap or skin graft, gives a better result.

Of 201 cases treated by radium, immediate cure was obtained in 124 instances, 72.5 per cent., no improvement in 36 cases, 21 per cent., slight improvement in 11 cases, 6.5 per cent. Of the 124 cases of immediate cure, 121 have been kept under observation for one or more years, 25 cases or 20.1 per cent. have recurred.

TREATMENT OF METASTATIC CARCINOMA BY DEEP RÖNTGEN THERAPY

When metastatic carcinoma of the spine has developed, we are dealing with the beginning or a part of a generalized carcinomatosis, and such a local manifestation can be influenced by treatment, although a permanent cure cannot be looked for by any means, however, at present. Pfahler (*S. G. O.,* 1919, xxix, 236) states that the life of the patient can be prolonged and made more comfortable, but later, in some area of the body, which has escaped treatment or has been unsuccessfully treated, the disease will make itself manifest. He encourages the use of the X-rays in the early treatment of carcinoma by proving that a favorable and certain effect can be produced upon cancer tissue, even in advanced stage, and discourages the practice of waiting for the use of Röntgen-rays until general carcinomatosis has taken place, or until metastasis has occurred, or until there is an extensive recurrence following operation.

The ideal method of treatment of carcinoma of the breast or carcinoma elsewhere consists of a thorough course of X-ray treatment preceding the operation, in which the disease is treated from every angle, and in which the lymphatic areas draining the breast are included in the ante-operative treatment. Within a few days a complete operation should be performed, and at the end of four weeks, from the time the first X-ray treatment was given, a second or postoperative course of treatment should be given, and repeated at intervals of a month or more for three to eight times.

The X-rays when applied properly and in sufficient quantity upon

deep-seated cancer tissue may be expected to destroy the cancer cell, and this cell is replaced by healthy scar tissue, or when the disease is located in the soft tissues it is replaced by fibrous tissue, and when located in bone it heals by bone sclerosis. It is entirely likely that these metastatic carcinomata of the spine, without other evidence of metastatic involvement, have an unusual amount of natural resistance, and that this increased resistance on the part of the patient helps greatly in the healing process. It seems that many of the patients die of visceral involvement before there is time enough for symptomatic disease to develop in the spine, and so it is only in the more resistant cases that there is time enough for spine metastasis.

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